CASE-BASED STUDY AND ANALYSIS OF INTEGRATED PROJECT DELIVERY (IPD) APPROACH AND TRUST-BUILDING ATTRIBUTES

Pardis Pishdad-Bozorgi

Dissertation submitted to the faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
in
Environmental Design and Planning

Yvan J. Beliveau (Chair)

Michael J. Garvin

Kihong Ku

Andrew McCoy

July 6, 2012

Blacksburg, Virginia

Keywords: Integrated Project Delivery (IPD), trust-building attributes, construction contracting, risk management, risks/rewards sharing, liabilities, tasks assignment

CASE-BAED STUDY AND ANALYSIS OF INTEGRATED PROJECT DELIVERY (IPD) APPROACH AND TRUST-BUILDING ATTRIBUTES

Pardis Pishdad-Bozorgi

ABSTRACT

The goal of this Ph.D. research is to explore the IPD contractual strategies, to highlight the elements that distinguish IPD from a traditional delivery approach, to analyze how trust-based relationships are established and promoted, and to demonstrate if/how trust and IPD contractual principles correlate.

The result of this research will promote the understanding of the industry on the strategies that promote trust and integration through real world case studies. The significance of the subject becomes more evident when reflecting on the current industry's crisis: productivity loss, fragmented delivery process, and lack of trust and collaboration.

Through a literature review a Project Delivery and Contracting Strategies (PDCS) framework, an IPD traits framework, and a trust-Building framework are developed. The frameworks are used as the organizational tools to structure and inquire relevant information on the two IPD projects.

An expert panel is assembled to discuss the frameworks and the findings of literature analysis and to seek the industry's insight on the units of analysis for contract, and the units of measure for trust. The units of analysis for contract are elements, such as strategies for risks/rewards sharing, liability considerations, decision making authority, and governance. The units of measure for trust are the individuals' perception, and the trust-building attributes as outlined in this dissertation.

Two IPD projects were selected and their contract agreements were studied. A questionnaire including both open-ended questions and multiple choice questions was developed based on the information collected through: 1. the IPD agreements in each case study, 2. the literature-based frameworks on trust and project delivery contracting strategies. Accordingly, two IPD case studies are developed following the analysis of their IPD agreements and the individual one-on-one interviews with their key IPD players.

The trust-building framework presented in this work includes a series of techniques that the contracting parties can follow when establishing their contractual and managerial strategies and also when interacting with each other.

DEDICATION

I dedicate this dissertation to my precious family:

To my special husband, Ali, whose love, caring, and companionship keeps my heart warm and my life filled with happiness, enthusiasms, and dreams. Ali, I want you to know that the future seems bright and every obstacle seems beatable when I have you by my side. You showed me how much you love me and value me not by words but by your actions, by putting my dreams and my comforts ahead of yours. Forever, I will be grateful to you for the sacrifices you have made in your education and career opportunities. I would not have been in the position I am today if I did not have your love and support.

To my father, whom I love very much and treasure every moment of my life. I have been always proud of you, Dady, for your strong work ethics, hard works, and the way you always did it with love and passion; you never seemed to get exhausted. You set a great role model for your children. I am so grateful to you for believing in me, having high hopes for me, and inspiring me to pursue my advanced education away from the comfort of home. This adventure has taught me so many precious lessons in life and given me such an invaluable insight in the early stage of my adulthood. I hope that I was able to make you proud.

To my mother, who sacrificed her own career and professional growth to spend time with her children and help them grow and succeed in their lives. Mother, you did an excellent job. Your contribution to society is admirable. We love you and value what you did for us.

To my grandpa, who is now resting in peace, he valued education so much, and wanted to see his grandchildren achieving the highest education possible with honors and awards. He was a true perfectionist and always aimed for excellence in every aspect of his life. Also, to my grandma, who is now resting in peace, for her love, faith, and prayers. I hope that I have made you two happy.

Finally to my wonderful siblings, Parisa, Reza, and Amir, and my great in-laws for their endless love, encouragement and support.

ACKNOWLEDGMENTS

My PhD journey has come to an end. It is time for reflection; it is time to take pride on the challenges I overcame, the knowledge I learned, the strength and wisdom I gained, and the contribution I was able to make; and most importantly, it is time to acknowledge the individuals whose support made this happen.

I would like to express my deepest gratitude to my PhD advisor, Dr. Yvan Beliveau, for his guidance and support both in research and teaching. Yvan has a unique and excellent way of advising. He walked by my side along my PhD journey and wanted me to find my own passion and build my own path. I remember the times when I felt lost, overwhelmed, and frustrated wandering around and switching research topics. During these tough times, Yvan patiently advised me and inspired me to get back on track and continue my journey. Every meeting and dialogue I had with him was inspiring and encouraging. I am grateful to him for the enormous amount of time he spent with me developing this dissertation, writing papers, and attending my conference presentations. Looking back now, his unique way of coaching and advising has led me to the path of my own passion, and helped me grow while gaining my own strength and independence. His positive attitude, his great vision, and his talent in having the big picture in mind set him aside and make him a great role model.

I would also like to express my sincere appreciation to my wonderful committee members: Dr. Michael Garvin, Dr. Kihong Ku, and Dr. Andrew McCoy. Each and every one has made a valuable contribution to this work by raising excellent questions, sharing invaluable insights, and providing constructive feedback and positive criticism. Also, I would like to thank Dr. Walid Thabet for his early contribution to the work, and also for putting me in touch with a company, who participated in my IPD research. Many thanks to the industry experts in the field of IPD who generously took time and supported this research.

My very special thanks go to my lovely husband, Dr. Alireza Bozorgi. I am grateful to him for all the time he spent with me discussing my PhD work, ideas, dreams, and my future career. His incredible love and support means a lot to me, especially when I remember how he desperately tried to help me succeed and see me happy when he was also going through his own PhD journey and his MBA studies.

I would also like to acknowledge Dr. Jesus de la Garza for his incredible mentoring and invaluable support ever since I met him. His encouragement and precious mentoring has played a key role in my academic success. I learned so many valuable lessons from him both through his formal instructions and his great example. It is truly a privilege to have him by my side.

Finally, I would like to thank all my dear family and friends for their love and support, most specifically my husband, parents, in-laws, siblings, Uncle Bahram and his wonderful wife, Aunti Behnaz, Suchi Kathleen, Brendan, Wenli, Anahita, Azadeh, Nicole, Ana, and Corrie.

Contents

List of Tables

List of Figures

CHAPTER 1 INTRODUCTION

Chapter one introduces the research scope, briefly discusses the background information and the problem statements, defines the contribution and significance of the subject, outlines the research aims and research methodology, and provides a brief overview to the overall organization of the dissertation.

1.1 Research Statement

This dissertation explores the Integrated Project Delivery (IPD) approach and the trust-building attributes in IPD arrangements.

1.2 Research Scope

The scope of this research includes literature review on the topics of IPD and trust-building attributes in construction contracting, as well as the development of two case studies on IPD arrangements. The IPD projects are selected based on their IPD characteristic.

IPD approach is a collaborative alliance of people, systems, business structures and practices into a process that aims to increase value to the owner thru reducing waste and maximizing efficiency.This research defines IPD as a spectrum of integrated delivery approaches and not a single delivery or contract type. Like other project delivery methods, IPD may appear in different varieties of contract type. The IPD spectrum starts with the delivery approaches that follow the IPD goal of eliminating waste and maximizing efficiency, have a shared risks/rewards model to some extent, have a joining/bridging agreement in addition to the multiple two-party contracts, and follow the IPD contractual and behavioral principles. The other end of the IPD spectrum includes the purest form of IPD with a single multi-party agreement.

The case studies selected for this research represent different level of integration along the IPD spectrum; one is based on a single multi-party agreement, and the other is based on an IPD agreement in addition to the multiple two-party agreements.

1.3 Background

IPD is an evolving project delivery and contracting strategies and currently a hot topic in the construction industry. Literature review and current debates in the industry among practitioners and scholars indicate that there is no general consensus on the defining characteristics of IPD. The initial definition of IPD by

Lean Construction Institute (2004) and (AIA California Council, 2007, p. 16) emphasizes the goal of IPD as to maximizing efficiency and reducing waste, and does not include much detail on its contractual characteristics:

Integrated project delivery (IPD), is a collaborative alliance of people, systems, business structures and practices into a process that harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction (Lean Construction Institute, 2004) & (AIA California Council, 2007).

Aligned with above definition (Duke, Higgs, & McMahon, 2010) and (Matthews & Howell, 2005, p. 61) declares that, "Integrated Project Delivery is relational, collaborative and lean; IPD aligns project objectives with the interests of key participants; IPD applies the same Lean principles to development and thus reduces waste and optimizes efficiency through all phases of design, fabrication, construction and occupancy. It creates an environment to allow proper allocation of resources and responsibilities in order to reduce errors and avoid rework.

In a later publication by (AIA National & AIA California Council, 2010), however, IPD is distinguished by a multi-party agreement:

"Integrated Project Delivery (IPD) is a project delivery method distinguished by a contractual agreement between a minimum of the owner, design professional, and builder where risk and reward are shared and stakeholder success is dependent on project success" (p. 4).

"Key Participants" to the IPD multi-party contract includes the owner, architect, and builder; however, an IPD multi-party agreement may also involve design consultants and subcontractors who sign "joining agreements" and are included in the shared risk and reward structure (pp. 4-6).

IPD emerges in response to the key challenge the AEC industry is facing right now: the loss of productivity resulting from the industry fragmentation and the growing number of claims and disputes. Productivity Index in the construction industry has been declining since 1964; that is while the productivity index in the non-farm industry has been increasing steadily (Per data by U.S. Department of Commerce, Bureau of Labor Statistics). The continuous productivity decline throughout the past decades reflects the deficiencies in the project delivery process.

Research on the history of Project Delivery and Contracting Strategies suggested that the productivity loss and the growing number of litigation and claims in the industry intensified with the development of

different specializations in the industry and dissolving of the master builders to the various expertise, such as Architects, Engineers, and Constructors.

Along with the formation of each specialization, a legal structure was established to define liabilities of each profession. The litigation began to increase as legal boundaries were defined and risks were shifted among various professions throughout the supply chain.

The result of such a fragmentation in the industry has led to the adversarial relationships, finger pointing, miss-communication, schedule delay, and budget overrun often seen in the construction projects. According to (Duke, et al., 2010), an equitably drafted contract, with shared risk model, coupled with the appropriate insurance strategy, should protect each team member and help break down the walls that have been created from decades of "risk shifting".

In response to the challenges stemming from the industry fragmentation, and in-equitable risk allocation, a new form of project delivery, named Integrated or Collaborative Project Delivery has emerged. Currently, IPD is the subject of discussion, research and attention in many professional gatherings both in academics and the industry.

The first IPD contract is called Integrated Form of Agreement (IFOA), a relational and collaborative contract developed for Sutter Health Project in 2005, in order to support implementation of Lean Construction Principles in every level of project delivery system, and to promote collaboration and integration.

Will Lichtig, a construction attorney in California, developed a relational contract for Sutter Health called Integrated Form of Agreement (IFOA). IFOA is a relational contract that seeks to promote a collaborative delivery approach and support implementation of lean construction principle. As a construction attorney, Lichtig has witnessed a high volume of claims in the industry. He knew there had to be a better way of delivering projects. In an interview with Lichtig, he stated that his goal was to "re-shape and change the industry by promoting a more collaborative and integrated approach" (Duke, et al., 2010, p. 11)& (Lichtig, 2005).

Following to the successful implementation of IFOA in Sutter Health Project, LCI developed a single multi-party agreement to facilitate the working of multi-firm teams and to support Lean Construction philosophy. A proposed standard contract was drafted by Will Lichtig and is called the "Integrated Agreement for Lean Project Delivery between Owner, Architect & Construction Manager/General Contractor." This is a single contract that lays out the agreement among all key parties for how the

building will be designed, built, and paid for, as well as how risk and reward will be apportioned. The LCI contract is meant to support the lean construction philosophy (Wilhelm, 2007).

Following to the development of the LCI's single multi-party agreement, AGC developed the Consensus Docs 300 series of Collaborative documents from the LCI Relational Contract.

Various Architecture and Contracting organizations, such as AIA, and Hanson Bridget have developed integrated/collaborative agreement. Even though the initial IFOA by Sutter Health and LCI Integrated Lean Project Delivery Contract, include lean principles and techniques; the later IPD/collaborative contracts may not include lean techniques (Wilhelm, 2007). The philosophy behind all IPD or Collaborative agreement, however, is a lean philosophy which is to reduce waste, increase value to the owner, and maximize efficiency through collaboration.

1.4 **Problem Statements**

In support of the recent movement toward integration and collaboration, different professional organizations in the industry such as Lean Construction Institute (LCI), Association of General Contractors (AGC), and American Institute of Architects (AIA) have developed standard IPD contracts, and published several guidelines and articles on the principles and characteristics of IPD.

Despite the growing numbers of publications on IPD, in real practice only few leading companies have started utilizing an IPD contract with shared risk and reward model. According to the industry practitioners, one of the key reasons for industry's slow response to adopting IPD is that IPD has not been tested yet. While in theory IPD sounds great, and friendly, in reality it is changing the risk/reward shared model which may expose parties to different sets of risks.

Committing to the shared risk/reward model in an IPD arrangement requires a thorough understanding of this approach and an established high level of trust among the contracting parties, as IPD ties individual success to the project success. In an IPD arrangement, contracting parties must potentially put faith and trust in each other's' abilities to deliver the project to the best of their ability and into the best interest of the project, as if one loses all will lose. To the eyes of many practitioners who are hesitant to IPD implementation, IPD expose them to a higher risk. They believe committing to an IPD arrangement requires a high level of trust among contracting parties.

A research study that carefully explores the IPD approach through real world IPD case studies, and demonstrates its associated risks and liabilities to each contracting party constructs a fundamental step

towards facing the current concern as stated in the previous paragraph. Furthermore, a study that investigates the influential factors facilitating trust-building in construction contracting is a fundamental step towards enhancing trust and integration in the AEC industry.

1.5 Contribution

The result of this study promotes understanding of the industry on the Integrated Project Delivery (IPD) approach and its contracting strategies through real case studies. Additionally, this research particularly explores the influential conditions facilitating the establishment of trust-based relationship during the contract negotiation phase, and also the influential factors promoting trust throughout the project in IPD arrangements. The enhanced understanding of the industry on IPD approach and the trust-building attributes will eventually promote trust, collaboration, and integration among different professionals in the industry.

1.6 The Significance of the Topic

The significance of the topic of IPD becomes more evident when we reflect on the goal of IPD and the context which leads to its development. The goal of IPD is to maximize efficiency and increase value to the project stakeholders through promoting collaboration among project participants. As discussed earlier, IPD is developed in response to the current productivity loss of the construction industry and the growing numbers of claims and disputes.

The study of trust-building attributes in the context of IPD is aligned with the current movement towards tackling the challenge of industry's fragmentation, and the growing numbers of adversarial relationships. It is a step toward promoting integration and efficiency.

1.7 Research Aim

The goal of this Ph.D. research is to explore the IPD contractual strategies, to highlight the features distinguishing IPD from conventional approaches, to analyze how trust-based relationships are established and promoted, and to demonstrate how trust and IPD contractual principles correlate.

1.8 Research Methodology

The aim of this research were achieved through accomplishing the following steps:

1) Conduct a comprehensive literature review and analysis on the subject of Integrated Project Delivery (IPD) approach and trust building attributes in construction contracting
2) Conduct a pilot study with an industry expert panel (focus group) to define IPD, identify key factors in selecting the IPD cases, define units of analysis for contract provisions, and units of measure for trust
3) Study, explore, and develop two case studies on IPD projects
4) Perform an analysis on the result of data collected through literature review, and case studies to accomplish the research goal

1.9 Research Organization

This dissertation includes eight chapters as follow:

- *Chapter 1: Introduction*

Chapter one introduces the research scope, briefly discusses the background information and the problem statements, defines the contribution and significance of the subject, outlines the research aims and research methodology, and provides a brief overview to the overall organization of the dissertation.

- *Chapter 2: Background*

Chapter two tells the story of the author's journey through the background literature and the continuous gap analysis and literature review which leads to the development of the research topic. The author starts the literature review with the topic of her interest, Project Delivery and Contracting Strategies. This chapter presents the background literature and the evolution of the research topic up to the final research proposal.

- *Chapter 3: Literature Review on Integrated Project Delivery (IPD) Approach*

Chapter three presents the result of literature review and analysis on IPD. It includes information, such as IPD definition, its origin and history, trait differentiating IPD from lean and a traditional delivery approach, IPD contractual arrangements and their liability provisions, risk management strategies, risk sharing, and contingency traits specific to IPD approach.

- *Chapter 4: Literature Review on Trust*

Chapter four presents the result of literature review and analysis on trust-building in construction contracting. It includes information, such as trust development process, different categories of trust, and influential factors promoting trust.

- *Chapter 5: Research Methodology*

Chapter five discusses the research methodology employed to conduct the research and accomplish the goals. It describes the research approach, including data collection and analysis in each stage of literature review, expert panel, case studies, and conclusion.

- *Chapter 6 and 7: Case Studies "PROJECT ONE" and "PROJECT TWO"*

Chapter six and seven present two case studies on IPD. Each case study is structured into seven sections: 1. Introduction to the project; 2. Project delivery and contracting strategy, using the PDCS framework; 3. IPD principles applied in the case; 4. Comparative analysis of IPD and a traditional delivery approach; 5. Trust development process and trust-building attributes; 6. Assessment of trust; 7. Comparative effectiveness of IPD vs. a traditional delivery approach on trust.

- *Chapter 8: Conclusions*

Chapter eight provides a brief overview to the integrated result of previous chapters. It includes the concluding statements on four key areas which are initially the aims to this research: 1. In-depth understanding of IPD approach; 2. Comparative analysis of IPD and a traditional delivery approach; 3. Influential elements on establishing and promoting trust; 4. IPD principles corresponding with trust-building attributes and comparative effectiveness of IPD vs. a traditional delivery approach on trust.

CHAPTER 2 BACKGROUND

2.1 Introduction

This chapter provides an overview to the author's journey throughout the literature to find an interesting area for contribution. It presents the continuous process of literature review-gap analysis, and the evolving research subject until arriving at a research topic which is SMART (Specific, Measurable, Attainable, Realistic, and Timely).

Traditionally, dissertations start with a SMART research topic and there is little or no discussion on the journey of the author, as how (s)he lands at the topic of research. Some doctoral students join other scholars on an ongoing research project, and some may follow other's recommendations for future research. In such cases, the researcher's journey starts with a SMART research topic and does not involve much research and investigation in the current body of knowledge for finding the gaps and visioning the valuable area for future research.

This was not the case for the author of this dissertation. The research effort in this dissertation starts with a fairly broad area of interest on the topic of Project Delivery and Contracting Strategies. Throughout a literature review and gap analysis the author envisioned various research paths forward for the future research. At some points, the author's inquisitive nature and her aspiration to excelling her knowledge drew her into multiple diverging directions. The author finds the process of defining the research topic as the most challenging part of the PhD studies and describes her experience through this stage, as exciting, overwhelming, and fascinating.

> "If we knew what we were doing it wouldn't be called research" (Albert Einstein, 1879-1955, German-born American Physicist).
>
> "Research is to see what everybody else has seen, and to think what nobody else has thought" (Albert Szent-Gyorgyi, 1893 –1986, Hungarian physiologist).

The author of this dissertation describes her vision of research as follow:

Research is an adventure; it is a process of exploration and creation, the start point is the choice of our passion, destination is undefined and ambiguous, what keeps us going is curiosity and motivation to excel.

2.1.1 Selection of the Research Field

The author initially starts her research by immersing herself with the subject of Project Delivery and Contracting Strategies (PDCS). She found this area as a fruitful field of study at her early career, as it provides a big picture to the whole process of planning, procurement, design, and construction, and will expose her to many potential areas. Furthermore, the author had already built a solid foundation on this subject through various graduate courses at Harvard University, and Virginia Tech. Through the study of PDCS, the author seeks to develop a big picture of the project implementation process and the elements of PDCS.

2.1.2 The Methodology for Defining the Research Topic

The methodology at this stage of research involves following stages: 1. Conducting a comprehensive literature review on the subject; 2. Building a complete endnote library, 3. Reading the literature articles, summarizing, and coding them; 4. Creating a framework that reflects the content of existing literature; 5. Identifying the gaps, and envisioning the potential future paths for research; 6. Selecting the research path to pursue. Through this process the author builds a solid foundation, identifies the gaps as well as the fruitful area for future investigation, and most importantly gradually narrows down the scope of the research. This process repeats as many times as needed until the research scope become SMART (specific, measurable, attainable, realistic, and timely).

2.1.3 The Snapshots of the Evolving Research Topics

The scope of this PhD dissertation is finalized following continuous literature review and gap analysis through three phases. **Figure 3.1** illustrates the three research phases until arriving at the final research topic. Each phase includes literature review on (a) certain topic(s), research outcome, and recommendation on potential areas for future research.

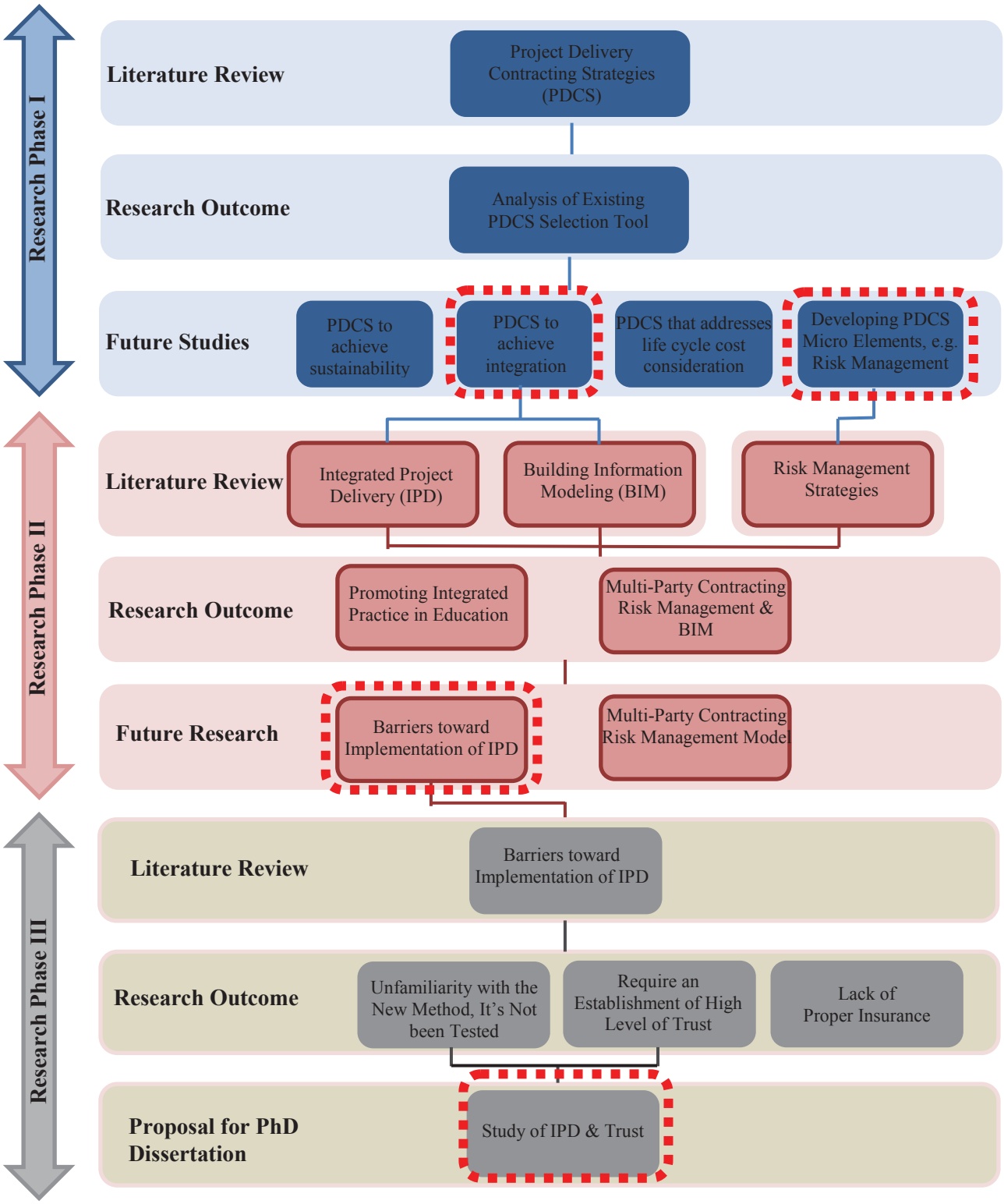

Figure 2-1: Development of the research topic: literature review and gap analysis

2.1.4 **The Published Results of the Literature Review and Gap Analysis**

The research outcome of each phase is published and presented in the peer-reviewed conference proceedings, as follow:

- *Research Phase I*

Pishdad, P. & Beliveau, Y. (2010). ***Analysis of Existing Project Delivery and Contracting Strategy (PDCS) Selection Tools with a Look towards Emerging Technology*.** Proceedings of 46th Annual International Associated School of Construction. Boston, MA.

- *Research Phase II*

Pishdad, P. & Beliveau, Y. (2010). ***Integrating Multi-Party Contracting Risk Management (MPCRM) Model with Building Information Modeling (BIM).*** Proceedings of CIB W78 Conference. Cairo, Egypt.

Pishdad, P. B., & Bozorgi, A., & Beliveau, Y. J. (2010). ***Towards Promoting A Collaborative Mindset***: ***Reaping the Benefits of Big Building Information Modeling (BIM) in an Integrated Real Estate Program.*** Proceedings of Ecobuild America, BIM Forum Workshop. Washington DC.

2.2 Analysis of Existing Project Delivery and Contracting Strategy (PDCS) Selection Tools

2.2.1 Executive Summary

The goal of research phase I is to explore the strategies for selection/development of Project Delivery and Contracting Strategies (PDCS) for construction projects; and to develop a PDCS framework that serves as a decision support tool for owners. Research scope includes literature review on the topics of PDCS and current PDCS selection tools, if any. The research outcome would benefit the owners in the programming/planning phase of a project, and mitigate the risk of selecting an inappropriate PDCS due to a lack of knowledge. Research process includes three phases: 1. Literature review, 2. Gap analysis, 3. Conclusion/proposal for future research. Following sections present the research outcome of this phase.

2.2.2 Abstract

This paper presents the results of literature-based research and gap analysis performed on the existing Project Delivery Contracting Strategy (PDCS) selection tools and outlines the areas in need for future research. Through a combinatorial approach, the scattered and resounding information from the literature is aggregated, categorized, and put into a framework structure.

Given the current state of art and future direction of the industry, the framework is then analyzed to determine its thoroughness with respect to its elements, their alternatives, and the selection factors affecting the choice of the PDCS for a particular project. The gap analysis indicates that the three emerging areas of green, integrated information, and life cycle cost considerations are not fully developed within the existing PDCS selection tools. Future study is needed to investigate the impacts of these emerging areas on the choices of PDCS elements. Furthermore, the existing selection tools are mainly developed around the „macro pieces" of the PDCS tools such as organizational structure, contract type, and selection method. However, there are „micro" pieces to the PDCS tools as well. Future research is needed to incorporate the micro elements such as task assignment, risk allocation/mitigation, contractual reinforcement, and process management into the PDCS selection tools.

Keywords: Project Delivery, Contracting Strategy, Decision Support Tool, Pre-Project Planning, Integrated Information

2.2.3 **Introduction**

Owners who need to embark on a construction project need to make an important decision on the project delivery of choice. According to Oyetunji & Anderson, "The decision made in the selection of a project delivery system for a project impacts all phases of execution of the project and greatly impacts the efficiency of project execution"(Oyetunji & Anderson, 2006, p. 3). Often an owner chooses a particular project delivery method because of history, momentum, and hard-headedness. That means that they usually tend to choose a PDCS method because they are used to it and not because of its appropriateness and suitability with the project condition. For this reason various PDCS selection tools have been developed by researchers to address this issue. These tools serve as the decision support tools for owners. They include selections factors, PDCS elements, their alternatives, and an evaluation matrix which correlate the selection factors with the appropriate project delivery method and contracting strategy. Different PDCS selection tools have been developed; each selection tool adds new elements and advances pre-existing tools to another level of sophistication.

The history of project delivery evolution indicates the fast-paced nature of project delivery changes especially in the last few decades. There are lots of reasons for this; the rapid development of the information technology world produces new technologies, means, and tools which at the same time requires new cultures and procedures to effectively and efficiently utilize these advancing technologies. People are getting more sophisticated, and their demands are growing. Consequently, the project requirements and the success criteria are evolving. It is critical to continually visit the changes of these new tools, cultures, procedures and demands and to develop a PDCS that would embrace these changes.

Project delivery and contracting strategies need to be redeveloped continuously in order to successfully satisfy emerging expectations and to utilize cutting edge technological tools and procedures in implementing the project.

Existing selection tools need to reflect current project objectives, selection factors, tools for implementing the project and new project delivery choices.

The purpose of this research is to study and analyze the existing PDCS literature in order to identify existing gaps within the field. This study will provide a future direction for research that improves the existing PDCS selection tools, benefiting the owners.

2.2.4 **Project Delivery Definition**

Project delivery has been defined in various statements throughout literature. As (Kenig, 2007) argued "there is no consensus on generally accepted definition of [the] term „deliver y method‟." The old definition of project delivery describes it as "how a project will be planned, designed, and built". The more current definition, however, is more thorough and includes the operation and maintenance as well. Different research definitions on the project delivery method indicate its various attributes. Some definitions are more comprehensive while some are more focused around a specific attribute of project delivery method. The following are a few selected definitions taken from the existing literature and categorized under defining characteristics:

- Management process: "A system for organizing and financing design, construction, operation and maintenance activities that facilitate the delivery of goods or services" (J. B. Miller, Garvin, William Ibbs, & Mahoney, 2000, p. 59).
- Procurement and risk allocation strategy: "A method for procurement by which the owner‟s assignment of "delivery" risk & performance for design & construction has been transferred to another party (parties)" (Mahdi & Alreshaid, 2005, p. 564).
- Packaging & sequencing: The way design, procurement, construction tasks are packaged for execution (Bowers, Bhargava, & Anderson, 2003) & (Al Khalil, 2002) & (Oyetunji & Anderson, 2006) & (The Construction Industry Institute Project Delivery and Contract Strategy Research Team, 2001).
- Team building strategy: Type of services that the Owners retain for the execution of the tasks, (Bowers, et al., 2003) how project teams form**,** project team procurement, project team working relationship & levels of involvement, (Korkmaz, Horman, & Riley, 2009) & (Mahdi & Alreshaid, 2005) & (Bowers, et al., 2003) parties that are directly contracted with the owner to form the project team/organizational structure, (The Construction Industry Institute Project Delivery and Contract Strategy Research Team, 2001).
- Roles & responsibilities: Means of contractually communicating expectation and basis of reimbursement (Kenig, 2007) roles & responsibilities of parties involved (Oyetunji & Anderson, 2006) & (The Construction Industry Institute Project Delivery and Contract Strategy Research Team, 2001).
- Financing Strategy: Owner financing vs. third party financing (Bowers, et al., 2003).

From these past definitions and thoughts, this research defines project delivery method as follows:

Procurement approach, financing strategy and a management system developed for accomplishing the project's objectives and tasks in order to deliver a project that is successful throughout its life cycle from concept to implementation, operation and maintenance.

2.2.5 Contracting Strategy Definition

The terms "Project deliver y" and "contracting strategy" are often used together. In fact contracting strategy is a supporting mean for successful implementation of project delivery approach. Following are a few selected contracting strategy definitions from the existing literature:

- How the owners pay for the services rendered by service providers; compensation approach for each contractual relationship (Bowers, et al., 2003).
- Means of contractually communicating expectation and basis of reimbursement (Kenig, 2007).
- Allocation of the financial risks between the owner and the service providers (Bowers, et al., 2003).
- Incentive to encourage contribution (Korkmaz, et al., 2009).

This research defines contracting strategy as follows:

Contracting strategy describes the roles and responsibilities of the contracting parties; it determines the risk allocation strategies, methods of payment, basis for reimbursement, and incentive strategies for encouraging enhanced contribution.

2.2.6 Project Delivery and Contracting Strategy (PDCS) Development

Most owners lack sophistication to understand different aspects of project delivery and contracting strategy. They usually prefer to use the project delivery system they know well or have used in their previous projects regardless of the fact that project delivery systems are not one size fits all. Each project has its own special characteristics with different entities involved; consequently, different project delivery and contracting strategies should be studied to offer viable delivery method for each type of project/owner. As Rubin and Worders argued, owners need to understand that different project delivery systems organize the building process differently, and each system allocates risk differently (Rubin & Wordes, 1997).

Gordon is among the initial contributors who offer a fundamental and viable approach for PDCS development. In the "Choosing Appropriate Construction Contracting Method" article developed by

Gordon, he argues that, "the construction contracting method is defined as having four parts- scope, organization, contract, and award. An owner must choose a particular organization, contract, and award for each project and combine them into the desired and appropriate contracting method for that project" (Gordon, 1994, pp. 196-197).

2.2.7 Existing Literature on PDCS Selection Approaches

According to A Guidebook for the Evaluation of Project Delivery Methods, "The relevant literature [on PDCS] can be divided into two groups: (1) literature that compares project delivery methods on the basis of observed performance measurements collected from a group of projects and (2) literature that provides a list of criteria and a framework for decision making. One of the best examples of the first kind of literature is a paper by (Konchar & Sanvido, 1998) in which a set of criteria is defined for a performance comparison of different delivery methods (i.e., DB, DBB, and CMR) in 351 building projects. These criteria are mostly objective and measurable such as cost growth, construction speed, and schedule growth. Some criteria are also defined to incorporate the quality performance of the delivery methods, such as difficulty of facility start up, number and magnitude of call backs, and operation and maintenance cost. (Konchar & Sanvido, 1998) divided the projects into six different groups (e.g., light industrial, complex office, and heavy industrial) in order to see clearer trends in each group" (Touran et al., 2009). The existing literatures on the second group present a variety of selection tools for owners. Following are some examples of the second type literature that provide a list of criteria and a framework for decision making.

Bowers, Bhargava, Anderson develop a framework to characterize eleven PDCS options used in practice and the criteria that led to their selection. Project phasing, team relationship, and compensation methods are the defining elements of the PDCS characteristics. The list of selection factors presented include budget constraints, change management, confidentiality, early cost guarantee, local conditions, owner‟s control, owner‟s internal resources, owner‟s project definition, performance accountability, project location, project size, risk allocation, schedule execution, site conditions, technology, complexity, early procurement. Using a relative index rating (RIR), the project objectives are prioritized. The PDCS option most appropriate for the high priority project objectives is then selected (Bowers, et al., 2003).

Loulakis presents a project delivery evaluation and selection matrix in order to assist owners. Previous research results on comparing different delivery methods like DBB, DB, Multiple prime, and CM are considered in order to rank and prioritize their appropriateness for different selection factors. The

selection factors are categorized under three major criteria: project goals, owner characteristics, and marketplace condition (Loulakis, 2005).

Mahdi and Alreshaid examine the compatibility of various project deliver y methods with specific types of owners and projects. In this study, the analytical hierarchy process is provided to assist in selecting the proper delivery method for a project. Typical combinations of delivery methods (organizational structures) and procurement selection criteria are presented. Characteristics, advantages and disadvantages of DBB, DB, CMR, and CMA are presented. Selection factors are categorized under owner characteristics, project characteristics, design characteristics, regulatory, contractor characteristics, risks, claims and disputes (Mahdi & Alreshaid, 2005).

Warne and Beard, through the Project Delivery Systems Owner's Manual provide valuable information to assist owners in their consideration of project deliver y system to use, given the owner‟s needs and specific project goals. Identifying project goals is defined as the first step in the decision making process. The project goals presented are quality, cost control, design expertise, schedule, specific product or outcome, risk, legal requirements, political direction, safety and security, and sustainability. The five project deliveries (organizational structures) considered are DBB, DB, Design/Contract-Build, CMR, DBO. In addition, selection and procurement/purchasing methods are considered (Warne & Beard, 2005).

Oyetunji and Anderson develop a decision support tool for identifying the optimal delivery solution for capital industrial and general building projects. Their approach utilizes a multi criteria decision analysis known as Simple Multi-Attribute Rating Technique with swing weights (SMARTS) for evaluating project delivery alternatives. The alternatives are the combinations of different organizational structures (DBB, CMR, DB/EPC, Multiple-prime, Turnkey, and Fast track), procurement timing, and management option (PM, CM). The selection criteria presented includes controlling cost growth, ensuring lowest cost, delaying or minimizing expenditure rate, facilitating early cost estimating, reducing/transferring risks to contractors, promoting early procurement, easing change incorporation, capitalizing on expected low levels of changes, protecting confidentiality, capitalizing on familiar project conditions, owner's controlling role, owner's involvement, project scope, number of contracted parties, and efficiently coordinating project complexity or innovation (Oyetunji & Anderson, 2006).

Kenig talks about different components of project delivery and contracting strategy, such as delivery method, management options (CMA, PM, Turnkey), selection method (low bid, best value, qualification), and contract type (firm fixed price, GMP, Cost plus fee, T&M). He presents the characteristics of the delivery methods - DBB, DB, CMR - in terms of their components features and their phasing strategy. He

argues that these components and their different alternatives would create various hybrids of delivery contracting methods (Kenig, 2007).

Mafakheri, Dai, Slezak and Nasiri present a decision aid model for selecting an optimal project delivery system using the analytical hierarchy process (AHP) coupled with rough approximation concepts. The model ranks the alternative delivery systems by considering both benchmark results and owner's opinion. Numerous factors are identified as having impact on the selection of a project delivery system (organizational structure). These factors are cost, schedule, quality, complexity, scope change, experience, value engineering, financial guarantee, risk management, uniqueness, external approval, project size, and culture. The project deliveries (organizational structures) evaluated in this research, are DBB, DB, CM/GC, CM/PM (Mafakheri, Dai, Slezak, & Nasiri, 2007).

The NCHRP synthesis presents by Anderson summarizes the PDCS state of practice for highway project that can potentially accelerate project completion. It also identifies driving factors, such as project type, size, complexity, completion date for selecting one type of alternative contracting technique over another. It presents a summary chart that identifies the compatibility of different project deliveries (organizational structures), procurement strategies, and contract management techniques with a list of project objectives, types and selection criteria (Anderson et al., 2008).

Touran, Gransberg, Molenaar, Ghavamifar, Mason, and Fithian study different project delivery methods (organizational structures) DBB, DB, CMR, DBOM for transit capital projects. They evaluate their advantages and disadvantages in terms of their compatibilities with several criteria; these are mainly categorized under five aspects: project level, agency-level, public policy/regulatory issues, life cycle issues, and other issues. The decision process presented offers three tiers: analytical delivery decision approach, weighted matrix delivery decision approach, and optimal risk-based approach (Touran, et al., 2009).

2.2.8 **Research Method**

As discussed previously, this is a literature-based research with the inclusion of current trends. It reviews the existing literature on PDCS selection tools produced by many authors. The selection factors, project delivery and contracting strategy elements and their alternatives are captured from the literature. Through a combinatorial approach, the captured information is then aggregated, categorized and structured to reflect pattern that is integrated into a framework format. The framework serves as a knowledge map to put background information of the field into perspective. The initial literature-based framework is then analyzed to examine its inclusiveness and thoroughness based on the current state of practice.

2.2.9 **Results: PDCS Framework**

The captured knowledge from the literature indicates scattered and often resounding information. As it is seen in the literature section, the wealth of information can be overwhelming and confusing, especially as the list grows. In order to understand the wealth of information, a structure for analyzing the existing literature and identifying the existing gaps is developed.

The PDCS tools in general consist of three parts: 1. Independent selection factors, 2. dependant PDCS elements and their alternatives, and 3. a decision support framework. The appropriate alternatives of PDCS elements are selected through a decision support framework. The framework is developed based on the existing knowledge regarding the characteristics of PDCS elements and their compatibility with the selection factors. The decision support frameworks utilized in these tools include variety of means such as series of tables, charts, figures, spreadsheets, and matrices to assist the decision-makers in prioritizing the project objectives, defining the relative importance of selection factors, identifying and ranking the appropriate PDCS alternatives relative to the desired objectives/selection factors, and ultimately selecting the appropriate choice of PDCS.

The existing PDCS selection tools in the literature offer different combinations on independent selection factors and dependent PDCS elements and alternatives. The dependent PDCS elements presented in the existing tools mostly involve macro elements. While the macro elements define the general characteristics and the context of the contract, the micro elements are also needed to address the implementation details required to ensure performance within the desired contract context.

These tools also utilize variety of decision analysis techniques in their decision support tools. The decision analysis techniques utilized in these tools mostly include multi-criteria decision analysis techniques -- such as analytical hierarchy process (AHP), simple multi-attribute rating technique with swing weights (SMARTS), multi attribute utility theory, and other techniques such as geometric mean, preference cones, and outranking method – relative index rating (RIR), and sensitivity analysis.

To conclude, the current frameworks lack both PDCS micro elements and current trends in the industry. The PDCS framework developed through this research, however, includes both the various PDCS elements in the existing tools as well as the current trends which may not be currently included in these tools. The PDCS framework as presented in this work introduces three major categories of elements: 1. selection factors (independent primary influential factors), 2. PDCS macro elements, and 3. PDCS micro elements. The overall framework runs to several figures and pages. Due to the space constraint, the

framework in its entirety is not included here. Instead a textual format with only a summary list of the included elements is presented below.

2.2.9.1 Selection Factors of PDCS

1. Project characteristics: project type, project size, complexity, uniqueness, location (distance from owner's resources), site condition, technological advancement, scope (well defined/poorly defined), completion rate of construction drawing before construction starts, degree of risk and uncertainty of unknown, potential for changes, building system characteristics, and building green features.
2. Project objectives: time related, cost related, time value of money, life cycle considerations, product quality (functionality/performance quality, aesthetic, degree of innovation, green, sustainability, energy efficiency), service quality(design/construction/turnover/operation quality, collaboration, team relation, coordination, Integrated information, constructability/ value engineering: early construction input, minimize interference with existing operation, minimize dispute/ adversarial relationship), safety & security (people safety, protect confidentiality of project document/proprietary technology), and stakeholders‟ satisfaction.
3. Owner's characteristics: owner's tendency towards applying a particular PDCS method, owner's desire for control over the project, owner's level of involvement, owner's in-house resources, owner's behavior towards risk, owner's attitude towards sustainability, and owner's choice on the number of contracting parties (single point of responsibility vs. multiple.
4. Market condition: availability of required service/commodity providers, and current state of the market.
5. Cultural/political/regulatory: political/regulation constraints, and culture of the society and institution.

2.2.9.2 Macro Elements of PDCS

1. Organizational structure: DBB, DB, CMR, CMA, DBO, DBOM, Multiple prime, Turnkey, Turnkey with finance, pure O&M, BOT, BOO, DBOT, BOOT, PPP, and IPD.
2. Phasing & sequencing strategy: linear (traditional), fast track (some aspects of actual construction precede the completion of design work), parallel (some preconstruction services are delivered while design work is incomplete), staged development, and early procurement.
3. Contract type (method of payment): fixed price (lump-sum, GMP, unit price, bid averaging, cap), and reimbursable (cost plus, time & material).
4. Award (selection) strategy: price oriented (low bid, best value, negotiation, design, construction, general condition, fee, contingency), design oriented, time oriented, prequalification (construction experience, financial capability, history of claims, team experience), and competitive qualification.

2.2.9.3 **Micro Elements of PDCS**

1. Task assignment: pre-project planning, finance, procurement, managing of the contracts, design (conceptual, detailed), engineering, precon. advisory (schedule, budget), construction, constructability/value engineering, project management (cost, schedule), coordination, close out, and operation and maintenance.
2. Risk measurement/allocation/sharing/mitigation: risk measurement and mitigation (insurance and
3. contingency), and risk allocation/sharing between parties.
4. Contractual reinforcement strategy (policies & procedures): incentive, rewards/saving shared model, disincentive, penalty clauses, liquidated damage, lost shared model, warranty, dispute resolution, info/document ownership, and basis of compensation (target cost, amount of contribution, accomplishment of assigned task).
5. Process management (policies & procedures): decision making (integrated, linear), information management (shared database vs. segmented info, accessibility of info, ownership of info/document), collaborations means and methods, leadership, and outside management option (program manager, project manager, CMA).
6. Contract characteristics: classical, neoclassical, and relational.

2.2.10 **Discussion**

It is observed through the literature that most of the existing PDCS tools have focused on the macro elements, with the most emphasis on the organizational structures. These tools and guidelines provide good insight into the characteristics, advantages, and disadvantages of the macro elements and their correlations with the selections factors. However, they do not fully address the micro elements of the system. Project delivery and contracting strategy development must go further beyond the macro elements.

Project Delivery Contracting Strategy (PDCS) framework developed through this research suggests consideration of both the macro and micro elements (see Figure 2-2). The framework presents a schematic and comprehensive process for project delivery and contracting strategy development.

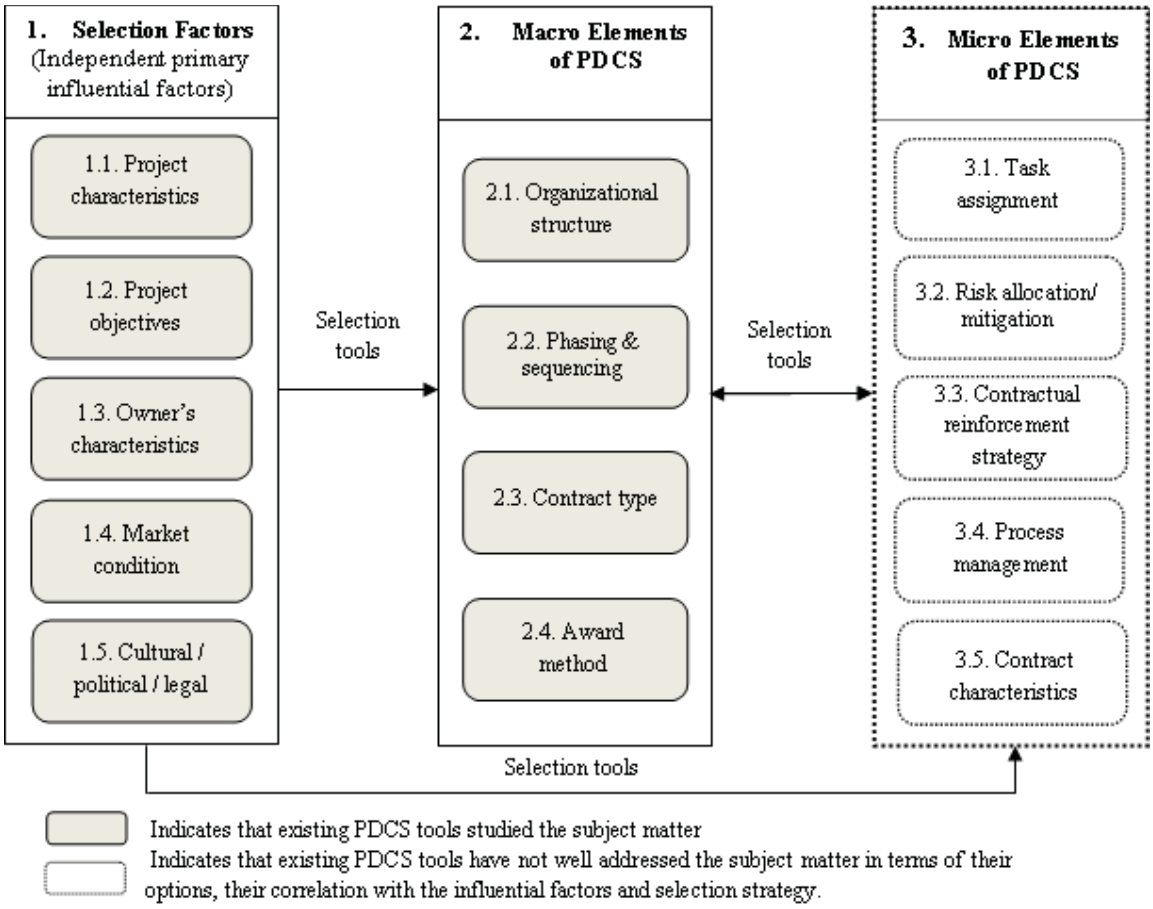

Figure 2-2: Project Delivery and Contract Strategy (PDCS) Framework

As depicted in Figure 2-2, the process of PDCS development involves two major selection cycles for macro and micro elements. Each selection cycle involves a series of decision making to choose the appropriate alternatives of various elements within that cycle. The choices of selection factors have direct impact on the choices of alternatives within each selection cycle. The results of each cycle may or may not influence the results of the other cycle. The PDCS selection cycles for macro and micro elements could be run independently or integrated relative to each other depending on the decision makers‟ choice and the situation. It is suggested that future research would study the micro elements, their options, characteristics, advantages/disadvantages, and their compatibility with both the independent selection factors, and the macro elements. Such a study would identify how certain selection factors and macro elements would lead to the selection of certain alternatives of micro elements.

Existing PDCS tools and guidelines do not include today's demands, standards, objectives, and new technological tools and elements. It is concluded that the PDCS tools and guidelines need to be periodically reviewed and updated to reflect current trends of the present time. For instance, green

building, integrated information, and life cycle cost consideration are three major trends in today's industry. The result of the literature review indicates that the existing PDCS selection tools have not fully addressed these three emerging trends as project objectives. Future research is needed to identify or to develop the compatible project delivery and contracting strategy elements both at the macro and micro level for successfully accomplishing these emerging project objectives.

The authors believe that understanding risk-related issues associated with integrated information are among the major challenges in today's industry. Furthermore, the authors‟ access to the emerging case study projects, which are utilizing integrated information and having contacts with insurance companies, who are trying to figure the new risks model for these projects, offers an excellent opportunity for in-depth research. This work is going to progress to its next phase through understanding the risk related strategies– risk identification, risk measurement, allocation/sharing, and mitigation -- for the projects with integrated information and building information modeling.

Such a study would identify the correlation between integrated information as one of the emerging project objectives with the risk related strategies as one of the micro elements of PDCS framework.

2.2.11 Recommendations for Future Research

The result of literature review and gap analysis led to the following recommendation for future research:

1. To develop PDCS that achieve the goal of integration
2. To enhance current PDCS selection tools
3. To study PDCS that achieve the goal of sustainability
4. To study PDCS that promote consideration of project life cycle performance

Figure 2-3 illustrates the literature review and gap analysis results of research phase I.

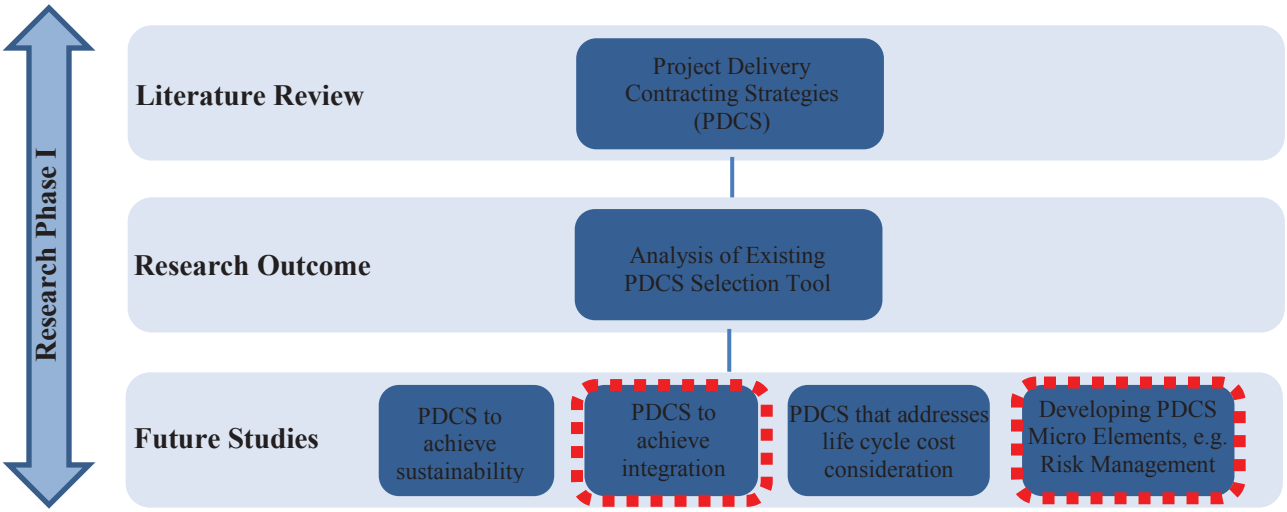

Figure 2-3: Research phase I: Literature review and gap analysis

2.3 Integrated Practices

The result of literature review and gap analysis of the previous phase led to the development of four potential paths for future research. The author chose to conduct her research on the PDCS that promote integration.

2.3.1 Executive Summary

The goal of research phase II is to explore strategies that would promote integration. Research scope includes literature review on integrated practices. The research outcome would provide the industry with an understanding of the existing practices that enhance integration. Research process includes three phases: 1. Literature review, 2. Gap analysis, 3. Conclusion/proposal for future research. Following sections present the research outcome of this phase.

2.3.2 Introduction

Project Delivery and Contracting Strategies (PDCS) have been constantly evolving to satisfy project needs. New Project Delivery methods usually begin to form when existing methods are found insufficient in delivering projects in an efficient manner. According to (Pishdad & Beliveau, 2010), the history of project delivery evolution indicates the fast-paced nature of PDCS changes especially in the last few decades. They argue that the rapid development of information technology and the shift in the cultures and procedures to effectively and efficiently utilize these advancing technologies are the underlying reasons for these evolutions.

In a transformation process, when changes occur and a new paradigm forms, the old problems and challenges -- which were the underlying reasons for changes-- would most likely go away and be replaced with new ones. The new challenges at first might not be recognized until the process is examined. Once recognized, another action is taken to correct the existing inefficiency, and this is a continuous loop which causes evolves the process towards progression.

Integrated Project Delivery (IPD) is a current evolving approach. According to (Duke, et al., 2010) "some of the most significant drivers of change [from the conventional approach to integrated approach] are: 1. Perceived inefficiencies in the current delivery model, 2. Renewed scrutiny on costs and budgets, 3. Desire for transparency, 4. Lack of trust, 5. Too much conflict, 6. Frustrations with defensive behavior

and finger pointing, 7. Desire to improve communication and collaboration, 8. Increased publicity on an alternative / better solution, and 9. Need for a better quality product"(p. 4).

For the above reasons, a transition is made from conventional delivery approach to an Integrated Project Delivery (IPD). IPD is a project delivery method distinguished by a contractual agreement between owner, design professional, and builder (at a minimum) to increase collaboration. In IPD, risk and rewards are shared and stakeholder success is dependent on participant behavior and project success. The goal of an IPD approach is to optimize the project outcome rather than focusing on the individual business outcome.

Multi-Party Contracting and risk sharing are relatively unique to this currently evolving paradigm. Comparison of conventional approach towards contracting and risk management with the IPD approach would allow us to understand the nature of transition, its direction, and its reasons. Furthermore, it would assist in better understanding the new paradigm and the potential areas for improvements as compared to the more settled approach of conventional methods and with considerations of new tools and technologies.

This paper therefore presents the comparative analysis of conventional methods and IPD methods, and their approach towards contracting, and risk management. The paper also discusses the currently emerging tools and technologies to assist the delivery of projects.

2.3.3 Conventional Project Delivery Strategies vs. Integrated Project Delivery (IPD)

A look at the history of Project Delivery Methods indicates the gradual shift of the industry's desire from segmentation and fragmentation towards collaboration and integration (R. Miller, Strombom, Iammarino, & Black, 2009) A reflection of this argument is better recognized when comparing the Conventional Delivery Methods like Design-Bid-Build with the Emerging Delivery Methods like Integrated Project Delivery (IPD) approach. The difference is more evident when comparing PDCS approaches towards organizational structure and the layout of project phases. DBB has a fragmented characteristic with much less integration among the parties and the phases. The IPD's approach presents a more collaborative and integrated approach.

"The traditional construction project is organized into three "camps" with diverse interests that sometimes converge and other times are opposed: owner, designer and contractor. Project participants come into their camps at various times during the project, with designers coming on early, construction managers (if

any) coming on in mid-design, and general and trade contractors coming on after design is substantially complete. Project communications typically reflect contractual lines, so that a trade contractor's issues flow up to the GC, over to the architect or owner, and if needed, down to the design consultant having the answer. As a result, traditional projects have organizations that resemble silos or chimneys, with each camp organized vertically and separated from each other by contractual walls"(Thomsen, Darrington, Dunne, & Lichtig, 2010).

Unlike the conventional delivery methods, the essence of the IPD is trust, integrity, and collaborative teams. Multi-Party contracting and Risk Sharing are two key contractual characteristics of the IPD approach which provides the opportunity for collaboration and reinforce integration among project teams. Building Information Modeling (BIM), as a technological tool facilitates integration of data and project coordination efforts (Cohen 2010), (Cooper, 2009), (AIA, 2009).

The following sections further elaborate the differences between IPD and Conventional approach with respect to their contracting strategies, risk management approaches and their applied tools and technologies.

2.3.4 Two-Party Contracting vs. Multi-Party Contracting

Contracting for more conventional project delivery methods often involves multiple two-party agreements between project participants. Due to this nature of contracting, there might not be direct relationships between various key participants (e.g. designers and constructors) in the project; and therefore, it is more difficult to align goals and incentives of the parties towards project success.

Unlike the conventional project delivery methods with two-party contracting agreements, 'true' Integrated Project Delivery (IPD) approach is based on single Multi-Party Contracting agreement among the key IPD players. A well-designed Multi-Party Agreement (MPA) for integrated project should promote collaboration and align the interests of Owner, Architect, Contractor and other stakeholders in terms of sharing risks and rewards.

Sutter Health is one of the early adaptors of Integrated Form of Agreement (IFOA) (Duke, et al., 2010). Essentially, there are four principal industry form IPD contract documents available for use: 1. Consensus DOCS 300, 2. AIA A195, B195 and A295 (Transitional IPD), 3. AIA C195 (Single Purpose Entity), 4. Hanson Bridgett. While several industry form contract documents exist in the marketplace, experts agree that an "ideal" contractual document does not" (Duke, et al., 2010, p. 30) & (Ashcraft, N/A, p. 9).

Multi-party agreements require thorough planning, team building, alignment of interests and goals, and careful negotiation of contract terms and risk management strategies. The process should include as many IPD players as possible who are willing to be part of risks/rewards sharing pool. Due to the critical role of risk management strategies in contract development, the following section further elaborates on this subject and present a comparative analysis of a conventional and IPD approaches' towards risk management.

2.3.5 Evolution of Risk Management Strategies

Risk Management process involves seven steps: 1) risk identification, 2) risk assignment 3) risk measurement, 4) risk control, 5) risk financing, 6) implementation, and 7) monitoring and evaluation. The goal of risk management is to ultimately reduce the total cost of risks in the project. As defined by (CII, 1993), the total cost of risk management includes: 1) cost of insurance, 2) losses, 3) cost for loss control and safety program, 4) claims handling expenses, and 5) administrative costs of risk management; this research also adds to the list, 6) cost of contingency. The potential economic loss of risk is evaluated through determining the probability of occurring loss and the magnitude of that loss. Effective risk management based on cooperation and trust would significantly reduce the total cost in a construction project.

The (AIA National & AIA California Council, 2007) compared the Traditional Delivery Methods with the Integrated Project Delivery approach from the risk management standpoint and highlight that in traditional delivery methods, risks are individually managed, and transferred to the greatest extent possible. Comparatively, in IPD, risks are collectively managed, and appropriately shared.

2.3.6 Risk Allocation Featuring Two-Party Contracting

Conventional project delivery contracting methods are often based on risk allocation. This risk allocation normally assigns risk to one party. Equitable risk allocation principle implies that each identified risk should be taken by a party who is best-positioned both technically to control/manage risk and financially to absorb risk should it occurs. Consequently, risk is most effectively and efficiently controlled, its possibility of occurrence and its severity is minimized, and ultimately the cost of risk is significantly reduced.

The review of literature and the interviews with experts indicate that the traditional projects are mostly based on the concept of risk allocation rather than risk sharing. "Traditional commercial terms result in riskier projects. As traditional construction contracts shift risk among the various participants, and

sometimes, despite the common wisdom [equitable risk allocation principle], the party who bears the risk is the one with the least bargaining power rather than the one best able to manage the risk. Even more problematic, this risk-shifting principle assumes that there is one, and only one, party that can effectively manage the risk. Not only is it unfair to make a party solely bear a risk it cannot effectively control, it is also inefficient. If a party is responsible for a risk it cannot effectively control, that unmanaged risk may hurt not only the responsible party but also the other participants and the project as a whole."(Thomsen, et al., 2010).

Inappropriate allocation of risks in a project can lead to considerable financial consequences. According to (CII, 2006) the cumulative financial impact of inappropriate risk allocation measured in 17 case studies totaled 14 percent of the cumulative construction budget.

As seen in **Error! Reference source not found.**, the largest financial impact of inappropriate risk allocation belongs to redesign and rework mainly resulting from ambiguous acceptance criteria in these case studies. The second largest component of financial impact nearly 20 percent came in the form of increased contingencies by contractors in response to inappropriate risk shifting by the owner. This supports the importance of implementing equitable and appropriate risk allocation/sharing technique as a risk management strategy in the contract negotiation phase.

In an effort to allocate risk equitably in a conventional project delivery approach, CII suggested utilization of the "Two-Party Risk Assessment and Allocation Model as a framework for contracting parties to assess and allocate risk through a cooperative, non-controversial contracting relationship. The primary means by which the model encourages two-party cooperation is through the utilization of a set of risk assessment worksheets. The worksheets are a means by which to bring two contracting parties to a place where both common and individual contracting concerns can be identified, discussed, and negotiated" (CII, 2007).

2.3.7 Risk Sharing Featuring Multi-Party Contracting

Equitable risk allocation principle might suggest that a risk best managed if it's assigned to more than one party and is shared. Besides effective risk management, risk sharing strategies facilitate alignment of goals and interest among the participants, promote team behavior, and incentivize the team to achieve project success. According to (Duke, et al., 2010), risk sharing is one of the core principles of IPD method and in fact is one major reason why the Architecture, Engineering, Construction (AEC) industry is now moving towards implementing the IPD method.

"Rather than simply shifting risk among each other, members of an IPD team typically agree in various ways to share risk and collectively manage it. By sharing risk, all project participants have a financial stake in effectively identifying and mitigating risks that in traditional projects would be 'someone else's problem', leading to a less risky project overall as well as a more equitable approach to risk management. When another's problem will have a direct impact on your bottom line, you are more likely to offer help in solving the problem – promoting an "all for one, one for all" culture with everyone trying to reduce risk in their own way. Collective risk management means less risk for the whole project.

IPD projects use many creative ways of sharing risks and fostering collective risk management. Three common approaches involve sharing the cost-savings or cost overruns against an estimated cost of the work, pooling some portion of the team member's profit and placing it at risk, and/or pooling contingency funds and sharing any amount remaining after project completion" (Thomsen, et al., 2010).

Compared to traditional delivery method, 'true' IPD offers a better opportunity of achieving equitable risk sharing and reducing the cost of risks. (AIA National & AIA California Council, 2007) argues that, "the increased interdependence of collaborative projects increases the number of parties relying on another party's contributions and who could potentially initiate a lawsuit. But the same interdependent web can reduce the likelihood and severity of loss. Exposure may increase, although true risk decreases". However, it is important to note that risk sharing is best suited for teams who have trust in each other and are collaboration.

2.3.8 Emerging IT Tools for Integration: BIM & PMIS

This paper focuses on two emerging technologies, BIM and PMIS as two emerging collaboration tools most appropriate for Integrated Project Delivery approach.

2.3.8.1 Building Information Modeling

BIM, the current buzzword in the Architecture, Engineering and Construction (A/E/C) industry, is known as a revolutionary paradigm. As with any new technology, BIM is evolving very rapidly and gaining momentum in our industry. Various definitions have been proposed for BIM, describing different aspects of it. Some describe BIM as a parametric object-oriented digital model. The model includes different types of information such as geometry, performance, attributes of building components, construction process, schedule, cost, and information on operation and maintenance. BIM helps users to learn about the whole building. "The idea behind a building information model is that of a single repository. Every item is described only once. Both graphical documents—drawings—and non-graphical documents—

specifications, schedules, and other data—are included. Changes are made to each item in only one place" (Cyon Research Corporation, 2003). BIM is highly complementary to Lean and IPD. While IPD without BIM could exist, BIM without collaboration is simply a representation tool such as Computer-Aided Drawing (CAD) tool.

Through capturing information in a single database and storing it in a central platform, BIM enhances the consistency of information and greatly reduces the communication errors associated with multiple models and different databases. BIM provides excellent benefits to an integrated team, key among them are: 1. A common platform and a shared knowledge source for information, 2. A documentation tool, 3. A collaboration tool, 4. Parametric, and 5. A tool for clash detection and constructability analysis.

A shared knowledge source for information: BIM serves as a common platform where project participants across disciplines converge around it to collaboratively build the digital models and figure out how difference pieces of the project come together. The shared knowledge source allows the team to see all different information about the facility in one place and ultimately to better recognize and address the conflicts and clashes of different pieces.

A documentation tool: "BIM is a documentation tool, replacing legacy-drafting procedures. It may include information such as the physical configuration, programmatic requirements, functional characteristics, specifications, systems performance, supply chain threads, construction sequence, cost or any other information that might be useful" (Thomsen, et al., 2010). Multiple customized reports extracted from BIM serve as contractual tool.

A technology for collaboration: BIM facilitates collaboration among teams, and serves as an integration tools for our fragmented and specialized building industry. "A basic premise of BIM is collaboration by different stakeholders at different phases of the life cycle of a facility to insert, extract, update or modify information in the BIM to support and reflect the roles of that stakeholder" (AIA National & AIA California Council, 2007).

Parametric: BIM has parametric characteristics. If properly structured and implemented, BIM can ensure that changes in a plan carry through to all of the related items in other plans and budgets. This enables the project team to avoid rework and engage in real-time estimating, as changes to the plans and design occur.

5- A tool for clash detection and constructability analysis: BIM provides the team with the opportunity to build virtually, to automatically identify the clashes, and to uncover problem before building physically.

It is important to emphasize that while BIM provides a great opportunity to promote design, construction, collaboration, and integration throughout a project life cycle, its full capacity can only be recognized in a collaborative environment.

2.3.8.2 **Project Management Information System (PMIS)**

Another emerging IT-based collaboration tools is known as Project Management Information System (PMIS). According to (Thomsen, et al., 2010), PMIS is a web-based shared database created and used by the project team. While BIM is known as a shared digital model representing physical and functional characteristics of the facility; PMIS is centralized databases representing project-specific information and non-geometric documentations.

PMIS proves to be beneficial in communication of information such as goal, scope, quality, organizational structure, roles, contract terms, general condition, time and cost. PMIS is a documentation tool. It manages documents such as: contracts, permits, approvals and commitments, and makes the data easily accessible to participants. PMIS records project status of a facility from concept to implementation. Such project data would be useful for portfolio management and for planning future projects.

2.3.9 Results: Integrating Multi-Party Contracting Risk Management Model with BIM

Considering the future direction of project delivery contracting strategies (PDCS) and their risk management approaches, this research further identifies the existing gap in current BIM process/tools and suggests development of a Multi-Party Contracting Risk Management (MPCRM) Model integrated with BIM. The proposed MPCRM model integrated with BIM extends the current capacity of BIM in serving the collaborative teams earlier in the process into the contracting phase. The model provides a decision support framework and a common platform for processing shared database on risk management strategy during the entire project life cycle – contracting, planning, design, construction, operation, and salvage. The discussion of the MPCRM model is out of the scope of this dissertation. Full description of the model can be found in the following paper:

Pishdad, P. & Beliveau, Y. (2010). Integrating Multi-Party Contracting Risk Management (MPCRM) Model with Building Information Modeling (BIM). Proceedings of CIB W78 Conference. Cairo, Egypt.

2.3.10 Recommendations for Future Research

The result of literature review and gap analysis of research phase II led to the following recommendation for future research:

1. Identifying the barriers and challenges towards implementation of Integrated Project Delivery
2. Further development of Multi-Party Contracting Risk Management Model

Error! Reference source not found. illustrates the literature review and gap analysis results of research phase II.

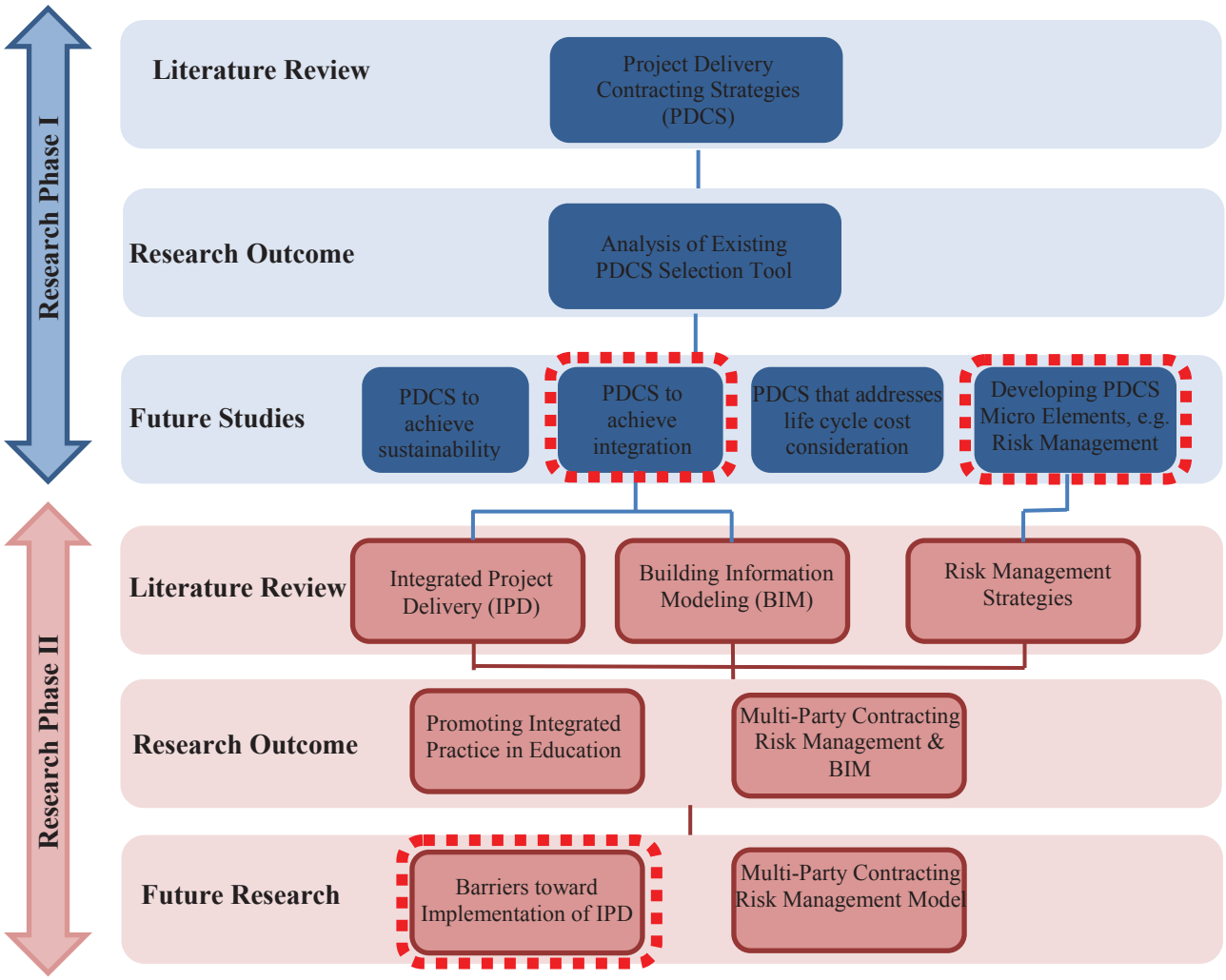

Figure 2-4: Research phase II: Literature review and gap analysis

2.4 Barriers towards Implementation of IPD

The result of literature review and gap analysis of the previous phase led to the development of two potential paths for future research. The author chose to explore the barriers towards implementation of IPD. The author's academic and professional background, her interest, and the emerging trends in the construction industry have been the major influential factors in selecting the research topic of choice.

2.4.1 Executive Summary

The goal of research phase III is to explore barriers towards implementation of IPD. The research outcome would provide directions for future research and development to overcome the current barriers towards integration. Research process includes three phases: 1. Literature review, 2. Gap analysis, 3. Conclusion/proposal for future research. Following sections present the research outcome of this phase.

2.4.2 Research Outcome

- *Problem Statement I: Industry's lack of understanding of IPD*

Although integrated solutions, such as IPD have merged, the industry is still utilizing the classical methods and approached in delivery of projects. IPD is not widely practiced. It is the premise of this research that one of the key barriers in adopting this new approach is the industry's lack of knowledge and understanding of this new approach and the fear of change.

As (AIA California Council, 2008) suggested, education and training through presenting the real world case study, outlining the lessons learned, and the benefits promote the IPD business model as well as its acceptance.

At the very core of this issue is the need to better understand the IPD shared risks/rewards models. According to (Salmon, 2009), "neither AIA nor Consensus DOCS has a solid pain share/gain share agreement for sharing, mitigating and allocating risk intelligently that motivates and incentives the entire integrated team to collaborate in achieving improvements in project quality, schedule, safety, sustainability, energy efficiency and costs. Collaborative Construction advocates the formalization of such programs and the need to tie the incentives to concrete metrics that optimize the project as a whole" .

"As risk allocation [sharing] is clearly defined and IPD business model evolves, the ability to adopt IPD as a delivery method will become easier" (AIA California Council, 2008, p. 4).

Research is needed to provide an in-depth understanding of shared risks/rewards models in IPD projects and to explore the impacts of such shared risks/reward model on traditional roles, responsibilities, liabilities, and risk exposures of Designer, Builder, and Owner.

- *Problem Statement II: Committing to IPD requires an established high level of trust among the participants*

Committing to the shared risk/reward model in an IPD arrangement requires an established high level of trust among the contracting parties, as IPD ties individual success to the project success. In an IPD arrangement, contracting parties must potentially put faith and trust in each other's' abilities to deliver the project to the best of their ability and into the best interest of the project, as if one loses all will lose. To the eyes of many practitioners who are hesitant to IPD implementation, IPD expose them to a higher risk. They believe committing to an IPD arrangement requires a high level of trust among contracting parties. On the other hand, IPD advocates say that IPD promotes trust. A case-study based research that provides an in-depth understanding of the shared risks/rewards model, the changes in liabilities, and risk exposures of participants, as well as the correlation of IPD and trust would be highly beneficial in addressing this concern.

- *Problem Statement III: Lack of suitable insurance products for IPD projects*

Conventional Insurance products and packages are not appropriate for the risk sharing models in IPD setting. IPD approach requires a customized insurance product suitable for its business model.

Unlike traditional delivery method, in which the designer is responsible only for the design errors and the contractor is liable for construction defects, the IPD method is built around the concept of shared risk and reward. "In many cases, project participants share, to one degree or another, in the success or failure of the overall venture. In this regard, the IPD arrangements are more likely to be classified as joint ventures than the independent contractor arrangements typically encountered under traditional models. A unique risk feature of joint ventures is the joint liability of all joint ventures.

Therefore, if all major IPD participants are deemed joint ventures, they may be liable to third parties for the failings of their joint venture partners. In this way, the construction team might well bear the risk of design error and the design team could be at risk for construction errors. This risk can be managed

through careful planning (e.g. appropriate insurance products and structuring the legal relationships between the parties) and contract drafting"(AIA National & AIA California Council, 2007, p. 18).

Considering this primary distinction between IPD delivery method and the traditional delivery system, conventional insurance which are based on the concept of separate responsibility for design and construction would be inappropriate for IPD projects. Thus, if a problem arises, there is the potential for gaps in coverage.

Insurance packaging has to evolve to keep pace with the industry needs and owner demands. "Currently, "of the shelf" insurance products are not designed for highly integrated projects" (Ashcraft, N/A, p. 23). According to (Cooper, 2009), few carriers are studying IPD: Zurich, Chartis, (AIG), Arch, and Ace. In which none have developed IPD ready product. One suggested insurance product for an integrated project is Controlled Insurance Policy (CIP). (Duke, et al., 2010) introduce CIP as a Wrap Up option for managing risk, incentivizing safe work habits and sharing risk and rewards. CIP can be purchased as a whole package for the project by the owner or the contractor as opposed to be purchased individually by the project participants.

Research are needed to provide the insurance underwriters with an in-depth understanding of the IPD approach and the changes IPD cause to the traditional assigned risks, liabilities, and roles and responsibilities assumed by Designers, Contractors, and Owners.

- *Problem Statement IV: Lack of a solid contingency packaging structure that supports risks/rewards sharing model, financial transparency, and dispute-free characteristics of IPD approach*

"All projects have some amount of contingency to cover unpredictable events. It may be hidden as padding within contract prices or cost estimates, or it may be made explicit in a contingency fund. In the cost-reimbursement approach typical of IPD jobs, the contingency fund is generally available to pay for mistakes made by the IPD team" (Thomsen, et al., 2010, p. 38).

"Unfortunately, there is significant confusion regarding contingencies when negotiating IPD agreements" (Ashcraft, N/A, p. 18).

"Some IPD projects have a contingency fund that if unused is shared by the owner and the IPD team. The convincing thought behind that arrangement is that the IPD Team will treat the contingency fund as its own money—as indeed it is—and manage it wisely. There is another advantage to having a shared contingency pool reducing the problem of contingency stacking. If everyone hides their contingency in

their contract prices, then the aggregate amount of all contingency for the project will be unknown to the team, and is quite likely to exceed the reasonable amount of quantified project uncertainty.

Some IPD advocates recommend keeping the contingency outside of the incentive compensation pool (i.e., all unspent contingency returns to the owner). That way, the owner will not be tempted to keep the fund too small or to seek to block its use. Also, IPD team members will not be tempted to blame others for mistakes that reduce the potential shared contingency savings.

And some IPD proponents advocate eliminating the contingency fund altogether when there is a pain sharing/gain sharing approach. This would require the owner to pay for IPD team mistakes as direct construction costs rather than from a contingency. Cost overruns, whether due to mistakes or poor costing, still are shared, so team members retain the incentive to avoid mistakes. Given that IPD team members have their liability limited to their profit pool, why would IPD team members need any contingency? On the other hand, IPD teams may be reluctant to truly risk performing a job with no profit, and without any explicit contingency may simply put hidden contingency into their cost estimates. Owners need to consider the trade-off between transparency and the potential for abuse of contingency" (Thomsen, et al., 2010, p. 38).

To provide contingency funds or not to provide, how and why-- is the question that can be addressed through a series of careful examinations of various contingency packaging structures in different IPD projects.

- *Problem Statement V: IPD approach is not included in the existing PDCS selection tools*

IPD is an emerging delivery method and did not exist by the time these tools were developed. Future research is needed to incorporate the PDCS elements of IPD into the PDCS selection tools. The outcome of such research would outline the selection factors leading to IPD approach and also the macro and micro elements of IPD contracting strategies.

- *Problem Statement VI: Fragmented silos of professionals mirroring the non-integrated disciplines-oriented educational systems*

The undergraduate curricula are typically focus-oriented and are offered under different departments. These programs offer the minimum amount of integration with other relevant disciplines, and therefore, the students and faculties have limited, if any, opportunities to collaborate with scholars from other programs. The direct impact of the educational system is reflected in the industry. The industry is

suffering from fragmentation and lack of collaboration among the practitioners. However, a successful practice in real world requires that professionals with different expertise work together as a team to deliver a project.

Building Information Modeling (BIM) offers a great opportunity for the integration of information and promoting collaboration across disciplines. Yet, BIM tools alone cannot solve the fragmentation issues. A social change and a collaborative mindset are needed to reap the benefits of BIM. Academia is in the best position to drive such transformation through re-visiting the curricula and making required adjustments.

In response to the current challenge, this research proposes the development of an Integrated Real Estate Program (IREP) which is built around both the concepts of IPD and BIM. IREP would be an umbrella program and a center of integration for various disciplines contributing to real estate industry: business, finance, architecture, construction, engineering, landscape, law, natural sciences, building science, and any other related program. Detailed description of the proposed program and the curriculum can be found in the following paper:

Pishdad, P. B., & Bozorgi, A., & Beliveau, Y. J. (2010). Towards Promoting A Collaborative Mindset: Reaping the Benefits of Big Building Information Modeling (BIM) in an Integrated Real Estate Program. Proceedings of Ecobuild America, BIM Forum Workshop. Washington DC.

2.4.3 **Recommendation for Future Research**

The result of literature review and gap analysis of research phase III led to the following recommendation for future research:

1. To provide an in-depth understanding of the selection factors, macro, and micro project delivery and contracting strategies of IPD approach.
2. To provide a comparative analysis of IPD and conventional approaches.
3. To study influential factor facilitating establishment and development of trust.
4. To study trust-building attributes in IPD arrangements.
5. To analyze the effectiveness of the existing insurance products in covering risks associated with IPD projects.
6. To analyze the effectiveness of the existing contingency packaging structure in sharing individuals' risks and rewards, promoting financial transparency, and eliminating disputes.
7. To enhance the existing PDCS selection tools by incorporating IPD approach.

2.4.4 **Research Proposal**

This dissertation is going to explore the Integrated Project Delivery (IPD) approach and trust-building attributes thru a case-based research. The goal is to explore the selection factors, macro and micro contracting elements of IPD approach, to analyze how IPD is different from a traditional delivery approach, to investigate how trust is established and developed, and to examine if/how contractual elements of IPD approach corresponds with the trust-building attributes. Figure 2-5 illustrates the literature review and gap analysis results of research phase III.

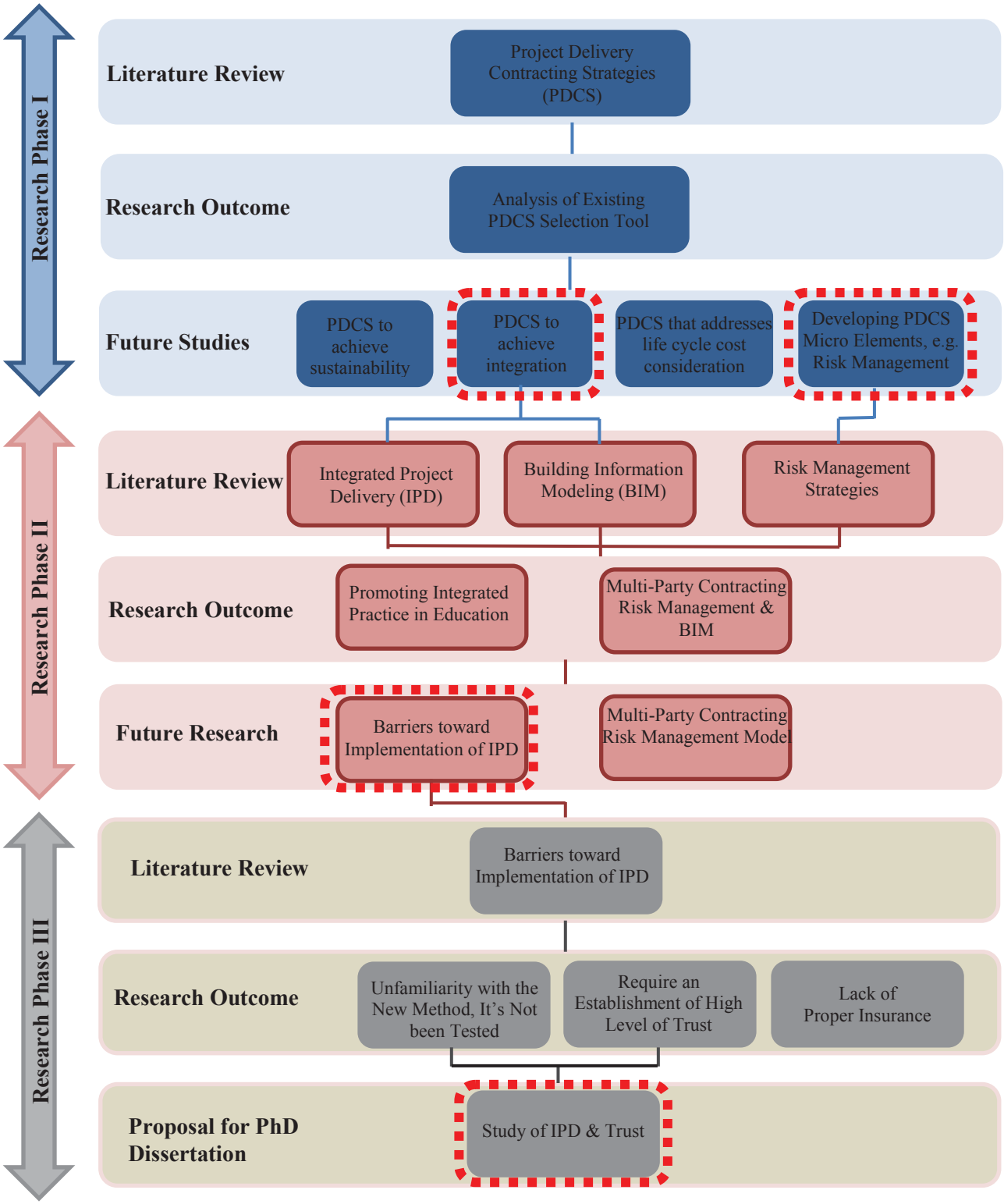

Figure 2-5: Research phase III: literature review and gap analysis

CHAPTER 3 LITERATURE REVIEW ON IPD

This chapter presents the result of literature review and an expert panel discussion on IPD. It provides background information on IPD approach, including: IPD definition, origin and history, its unique characteristics differentiating it from Lean and a traditional delivery approach, its various legal arrangements, finally risk sharing and financing strategies. At the conclusion of this chapter, IPD traits and its differentiating characteristics is summarized in a table which is utilized as a framework for determining the level of integration of each IPD project.

3.1 Definition of IPD

The literature review and the current debates in the industry among practitioners and the scholars indicate that there is no general consensus on the defining characteristics of IPD. The initial definition of IPD by Lean Construction Institute (2004) and (AIA National & AIA California Council, 2007) emphasizes the goal of IPD without including much detail on its contractual characteristics:

- *Integrated collaborative process aimed to increase value to the owner thru reducing waste and maximizing efficiency*

Integrated project delivery (IPD), is a collaborative alliance of people, systems, business structures and practices into a process that harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction. (Lean Construction Institute. 2004) & (American Institute of Architects California Council. 2007).

Aligned with above definition, (Duke, et al., 2010) and (Matthews & Howell, 2005, p. 61) declares, "Integrated Project Delivery is Relational, Collaborative and Lean; IPD aligns project objectives with the interests of key participants; IPD applies the same Lean principles to development and thus reduces waste and optimizes efficiency through all phases of design, fabrication, construction and occupancy. It creates an environment to allow proper allocation of resources and responsibilities in order to reduce errors and avoid rework.

In a later publication by (AIA National & AIA California Council, 2010):

Integrated Project Delivery method is distinguished by a multi-party agreement that aligns business interest of all parties and embodies the following contractual and behavioral principles. Please see Table 3-1.

"Integrated Project Delivery (IPD) is a project delivery method distinguished by a contractual agreement between a minimum of the owner, design professional, and builder where risk and reward are shared and stakeholder success is dependent on project success" (p. 4).

"Key Participants" to the IPD multi-party contract includes the owner, architect, and builder; however, an IPD multi-party agreement may also involve design consultants and subcontractors who sign "joining agreements" and are included in the shared risk and reward structure (pp. 4-6).

Table 3-1: Principles of IPD

Contractual principles of IPD	Behavioral principles of IPD
Key participants bound together as equal	Mutual respect and trust
Shared financial risk and reward	Willingness to collaborate
Liability waivers between key participants	Open communication
Fiscal transparency between key participants	Collaborative innovation
Early involvement of key participants	Honoring promises
Intensified early planning	Acting in the best interest of the project
Jointly developed project target criteria	Organization and leadership
Collaborative decision making and control	

The initial definition of IPD in 2007 only focuses on the goal of IPD which is to increase value to the owner, reduce waste, and maximize efficiency. According to (AIA California Council, 2007; AIA National & AIA California Council, 2007), Integrated Project Delivery principles can be applied to a variety of contractual arrangements. The latest definition of (AIA National & AIA California Council, 2010), however, distinguishes IPD by its unique multi-party contract.

According to (Post, 2010, p. 22) "the latest shift toward team-centric project delivery, in which the owner, architect and contractor sign a single contract, is still not consistently defined, understood or practiced, agree the experts" (p. 22). This study interviewed with few experts in the industry and got their insight on IPD and how they would define IPD. The result of the expert panel indicated that there is also no general consensus on the definition of IPD. Some defines IPD according to the (AIA California Council, 2007) definition; while others differentiate IPD by a multi-party agreement.

3.2 Goal of IPD

The goal of IPD is to maximize efficiency and increase value to the project stakeholders through promoting collaboration among project participants.

3.3 Origin and History of IPD

- *The first IPD contract is called Integrated Form of Agreement (IFOA), a relational and collaborative contract developed for Sutter Health Project in 2005,in order to support implementation of Lean Construction Principles in every level of project delivery system, and to promote collaboration and integration.*

LCI characterized three systems featuring a project delivery process: 1. Physics of work (how a building is built), 2. Organization and system (The relationship between multi-firm companies), and 3. Contract (The commercial structure). Please see Figure 3-1. LCI and implementers of last planner historically has focused on the physics of the work in order to reduce project waste (Lichtig, 2005).

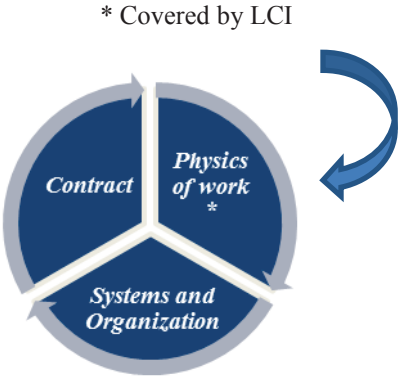

Figure 3-1: Systems featuring a project delivery

With the assistance of Lean Project Consulting, Inc., Sutter Health has developed an approach that supports lean philosophy in all three systems featuring a project delivery approach. The new approach later became known in the community as the five big ideas: 1. Collaborate, really collaborate, 2. Optimize the project not the pieces, 3. Tightly couple learning with action, 4. Increase relatedness, 5. Project as networks of commitments.

To further support lean philosophy in all three systems within a project delivery approach, Sutter Health developed a relational contract. Participants at Sutter Health project explain that Lean construction

principles have been around for almost 20 years but few contractors or architects used them in part due to the absence of a relational contract. Will Lichtig, a construction attorney in California, developed a relational contract for Sutter Health called Integrated Form of Agreement (IFOA). IFOA is a relational contract that seeks to promote a collaborative delivery approach and support implementation of lean construction principle. As a construction attorney, Lichtig has witnessed a high volume of claims in the industry. He knew there had to be a better way of delivering projects. In an interview with Lichtig, he stated that his goal was to "re-shape and change the industry by promoting a more collaborative and integrated approach". (Duke, et al., 2010, p. 11) & (Lichtig, 2005).

- *Following to the successful implementation of IFOA in Sutter Health Project, LCI developed a single multi-party agreement to facilitate the working of multi-firm teams and to support Lean Construction philosophy.*

Lean Construction Institute (LCI) took a lead and developed a new form of agreement to facilitate the working of multi-firm teams and embed lean processes into an explicit understanding of how work will be done. A proposed standard contract drafted by Will Lichtig and is called the "Integrated Agreement for Lean Project Delivery between Owner, Architect & Construction Manager/General Contractor." This is a single contract that lays out the agreement among all the key parties for how the building will be designed, built, and paid for, as well as how risk and reward will be apportioned. The LCI contract is meant to support the lean construction philosophy (Wilhelm, 2007).

Following the development of the LCI's single multi-party agreement, AGC developed the Consensus Docs 300 series of Collaborative documents from the LCI Relational Contract.

Various Architecture and Contracting organizations, such as AIA, and Hanson Bridget have developed integrated/collaborative agreement. Even though the initial IFOA by Sutter Health and LCI Integrated Lean Project Delivery Contract, include lean principles and techniques; the later IPD/collaborative contracts may not include lean techniques (Wilhelm, 2007). The philosophy behind all IPD or Collaborative agreement, however, is a lean philosophy which is to reduce waste, increase value to the owner, and maximize efficiency through collaboration.

Error! Reference source not found. summarizes different variations of IPD contract.

Table 3-2: Different variations of IPD contracts

Industry standard IPD contracts	Different variations of IPD contract			
	Transitional IPD with Multiple Contracts	Single Multi- Party Contract		
		Relational contracts	Single Purpose Entities	Project Alliances

3.4 How IPD and Lean are Different?

Within the industry there is a fair amount of confusion on the difference between lean and Integrated Project Delivery (IPD) (AIA National & AIA California Council, 2007). As described in literature, the goal of IPD and Lean, both is to eliminate waste, maximize efficiency, and increase value to project stakeholders. Both IPD and Lean require behavioral principles, such as trust, collaboration, communication, and reliability. They both view a project as a collective enterprise and a network of interrelated systems as oppose to silos of fragmented systems. Such a close similarities of the two subjects raised the bell in many curious minds as if or how these two recent trends are different. This research also clarified the current ambiguity with respect to IPD and Lean which results from the overlapping scope of the two in the existing literature. The study conducted a comprehensive literature review to collect information on both subjects. Additionally, it formed an expert panel on IPD from the leading practitioners in the industry. Through a combinatorial approach, this study analyzed the gathered information through literature and IPD panel discussion and mapped them as they became to existence through time. Finally, the principles and their defining elements comparatively analyzed to further reflect on their relationships and the unique features of each.

3.4.1 Definition of Lean

Lean construction as defined by LCI, is a production management-based project delivery system emphasizing the reliable and speedy delivery of value. Lean aims to reduce waste, maximize efficiency, and increase value to the project stakeholders. In order to achieve its goals, lean views a project as a collective enterprise and a network of integrated systems, and seeks to optimize the performance of the network as a whole. Unlike traditional approaches, which divide the project into cascades of work packages assigned to parties, lean focuses on collaborative delivery, the integrity of the entire network, and the work flow optimization.

To support lean implementation, Greg Howell and Glenn Ballard, the co-founders and directors of LCI have developed the Lean Project Delivery System (LPDS) and the Last Planner System of Production

Control. LCI also developed a new form of agreement to facilitate the working of multi-firm teams in a lean-oriented process. The agreement is a single multi-party contract between Owner, Architect, and Builder and is called the "Integrated Agreement for Lean Project Delivery. As (Wilhelm, 2007), “the traditional approach to construction project management can lead to near chaotic situations, finger-pointing, re-planning, negotiating for more time and money, and sometimes, financial liability pushed as far down the supply chain as possible. LCI's methods use team planning and pull techniques to develop the phase schedules that integrate the work of multiple subcontractors who will conduct structural, mechanical, electrical, and other work. Integrated plans configure supply systems (flows of materials and information) with project execution (work flow and resource flow)”. Behavioral principles essential to lean methods are team work, communication, coordination, and reliability (honoring promises).

3.4.2 Goal of Lean

The goal of the Lean journey is to achieve minimal waste and maximum value for the benefits of all project stakeholders.

3.4.3 Origin and History of Lean Construction

Lean construction traces its root to lean production techniques in manufacturing. “The term “Lean” was first used by Toyota to describe how its production system aims to eliminate waste in manufacturing. The ideal was to produce a car to the requirements of a specific customer, deliver it instantly, and maintain no inventories or intermediate stores. Lean construction applies similar principles to the construction process In the 1990s, Greg Howell, Glenn Ballard and Lauri Koskela began developing independent strategies for using lean in the delivery of construction projects. When applied to construction, lean changes a project from a combination of activities to a system of dependent and variable tasks that must be managed based upon the unique human interactions that support work being done” (AIA National & AIA California Council, 2010, p. 57).

3.4.4 Lean Principles

Lean principles formed around the idea of collaboration. As described by AGC (2009) Lean principles focus on aligning the interests of the parties, strengthening relationships, promoting collaboration, focusing on what is best for the project, and seeking constant improvement. Pinch (2005) definitions of Lean principles are more action-oriented and include features, such as establishing an integrated team of all participants, concurrent project design and process design, decentralizing decision making and empowering project participant, and transparent process.

3.4.5 **Result: Comparative Analysis of Lean and IPD**

Table 3-3 presents the essential feature and principle of lean, and their corresponding IPD principles.

Table 3-3: Comparative analysis of lean principles and IPD principles

Essential Features of Lean Project Delivery System according to Ballard (2000)	Integrated Project Delivery Agreement
A value generating process	IPD goal
Downstream stakeholders are involved in front end planning and design through cross functional teams	Early involvement of project participants Jointly developed project criteria Intensified early planning
Project control has the job of execution as opposed to reliance on after-the-fact variance detection	Joint control Target value design replacing value engineering associated with traditional delivery approach
Optimization efforts are focused on making work flow reliable as opposed to improving productivity	Shared risks and rewards Individual's success tied to project success
Pull techniques / Feedback loops	Depends on the core team action plan
Lean principles according to AGC (2009) & Pinch (2005)	Equivalent behavioral and contractual principles often enforced in IPD agreements:
True collaboration among all participants Establishing integrated team	IPD principle on collaboration Single multi-party contract or joining agreement
Strengthening and Aligning the relationships and interests of the parties to the project	Key participant bond together as equal Shared risks and rewards Individual's success tied to project success
Project participants making commitments to work and schedule that can be relied upon by others, and that drive out waste in the form or RFIs, changes and rework	Reliability, honoring promises, and trust
Focusing on what is best for the project as a whole and not just certain component parts	Acting in the best interest of the project Tying individual success to the project success Shared risk and rewards
Decentralizing decision making, empowering participants	Collaborative decision making, joint control
Making the process transparent	Open communication, shared information, Transparent process
A clear quick to request action and receive a response	Open communication

Both lean and IPD requires a shift in mindset from individual contracts to a collective enterprise. As seen through the literature, lean construction and Integrated Project Delivery (IPD) share a common philosophic approach which is to reduce waste and maximize efficiency and value to project stakeholders.

Lean principles of Toyota Manufacturing have led to the development of lean construction. Lean construction aims to view a project as a collective enterprise and a network of interrelated delivery systems in order to enhance efficiency and the performance of a project as a whole. As a result, systems integration, communication, and collaboration are integral to lean construction.

As Lichtig states, historically LCI has focused on the physics of the work, how the project is built from planning to implementation. Respectively, LCI has developed tools and techniques that would benefit the physics of the work, such as last planner systems, pool scheduling, 5S plan, concurrent project and process design, and work flow productivity optimization. However, according to Lichtig, in addition to the physics of work there are two other components that impact a delivery of a project: system organization, and contract structure.

Despites the presence of lean construction principles for twenty years, lean had not been practiced frequently by Architects, and Builders mainly due to the traditional structure of project deliveries and contract structures. The siloed organizational structure of project deliveries, and the risk shifting/allocation provisions in the traditional contracts was the key barrier to systems integration, collaboration, proper communication, and flow of information.

To support implementation of Lean principles and to reap the full potential of lean, Sutter Health Center developed an Integrated Form of Agreement (IFOA). Following the successful implementation of IFOA, LCI developed the first single multi- party contract called an Integrated Agreement for Lean Project Delivery. AGC also developed the Concensus Docs 300 based on the LCI's agreement. Currently, there are various industry standard form Integrated/Collaborative Project Delivery agreements developed by different Architecture and Construction organizations.

Even though the initial LCI's integrated agreement includes the Lean tools and techniques, the latest IPD contracts may or may not require the implementation of lean tools and techniques.

Current IPD agreements in general focus on designing an organization structure, and contract strategies that facilitate formation of an integrated team through shared risks and rewards provision, early involvement of key participants, collective decision making, joint control, and jointly developed project criteria. The decision on the action plan for the physics of the work, such as implementation of certain lean tools and techniques may not be emphasized and are often recommended but not required.

IPD is a relational contract that aligns the interest of all parties, and creates an organizational structure that is collaborative, and integrated (Matthews & Howell, 2005). Lean tools and techniques can only be

implemented effectively in such a collaborative and integrated environment. IPD can exist without incorporating lean tools and techniques, and lean tools and techniques could also be implemented in a collaborative environment that may not have an IPD contract administered. However, both IPD and Lean could highly benefit each other in fulfilling their common goals which is to reduce waste, maximize efficiency and values to the project stakeholders.

3.5 Traits differentiating IPD from a Traditional Delivery Approach

Table 3-4 presents the traits that differentiate IPD from a traditional delivery approach. The table is put together by the author based on the information captured from the AIA National, & AIA California Council (2007).

Table 3-4: Traits differentiating IPD from a traditional delivery approach

Differentiating Traits	Traditional Project Delivery	Integrated Project Delivery
Team	Fragmented, assembled as needed	Integrated, assembled early
Decision Making	Individually made, Usually one overriding vote	Unanimously and collaborative made at the best interest of the project
Process	Linear, segregated, silos of knowledge	Concurrent, multi-level, information shared
Managing cost	Value engineering: estimating detailed design	Target value design: Designing to a detailed estimate
Risk	Individually managed, transferred to the greatest extent possible	Collectively managed, appropriately shared
Liability	Individual professional liability	Joint liability, in some cases no suite clauses or waiver of consequential damages
Compensation/Reward	Individually pursued	Individual success tied to project success
Communications/ Technology	Paper-based, or fragmented IT tools, 2D	BIM, 3/4/5D
Agreements	Allocate, transfer risk, no risk sharing, transactional contract	Encourage information sharing, risk sharing, collaboration, relational contract

3.6 IPD Contractual Agreements and their Liability Provisions

The first Integrated Form of Agreement (IFOA) in U.S. was developed for Sutter Health Project. "Sutter Health utilized some of the first IFOA's on their initial IPD projects. Those contracts have been modified and adopted by other agencies since that time. While several industry form contract documents exist in the marketplace, experts agree that an "ideal" contractual document does not. Essentially, there are three principal industry form IPD contract documents available for use: 1. Consensus DOCS 300; 2. AIA A195, B195 and A295 (Transitional IPD); 3. AIA C195 (Single Purpose Entity), [4. Hanson Bridget] " (Duke, et al., 2010, p. 30).

One of the distinctive features differentiating various delivery and contracting methods from each other is their approach towards liabilities provisions and risk management strategies which ultimately affects the behavior of the contracting parties. For example, in traditional risk management approach, each party is fully responsible for its own failing. As Ashcraft states, this introduces counter-productive finger pointing and fear" (pp. 22-23). However, "IPD arrangements contemplate a high degree of collaborative effort. In many cases, project participants share, to one degree or another, in the success or failure of the overall venue.

In this regard, IPD arrangements are more likely to be classified as joint ventures than the independent contractor arrangements typically encountered under traditional models. A unique risk feature of joint ventures is the joint liability of all joint venturers. Therefore, if all major IPD participants are deemed joint venturers, they may be liable to third parties for the failings of their joint venture partners. In this way, the construction team might well bear the risk of design error and the design team could be at risk for construction errors. This risk can be managed through careful planning (e.g., appropriate insurance products and structuring the legal relationships between the parties) and contract drafting" (AIA National & AIA California Council, 2007, p. 19).

Each Integrated Delivery contract has implemented different approach towards liability and risk management strategies. Thus, it is not appropriate to generalize certain liability provisions as typical to all IPD contracts. For example, "under section 3.8 of Consensus DOCS 300, the parties mutually agree upon an approach to risk allocation. The options include:

Safe Harbor Decisions: The parties release each other from any liability resulting from project decisions that are collaboratively made by the Management Group.

Traditional Risk Allocation: Under this approach each party remains liable for its own negligence and breaches of contract or warranty, subject to optional specific, agreed upon (fill in the blank) limitations for the Designer and Constructor" (AGC, 2009, p. 22).

According to (Thomsen, et al., 2010), "at the start of an IPD project, the owner and the Core Team must agree on a legal structure for Core Team. The technical considerations to ponder are those of liability, taxes, legal authority and administrative cost. However, an overarching consideration is the effect of the legal structure on the team's culture. The salient question is: what form of legal entity maximizes collaboration and will work for the specifics of the project and the constraints of the owner? (Clearly public, institutional and private organizations will pose vast differences in procurement regulations.) The common choices Core Team may consider are:

- Multiple independent contracts (the traditional approach)
- A joint venture (a JV)
- A limited liability company (an LLC)
- A single multi-party contract " (p. 85).

Following the decision on the legal structure for the core team, the owner could then either select from the existing standard industry form contract or self-customize their own contract. Following describes the characteristics of the typical core team legal structures for IPD contracts and their liability provisions.

3.6.1 **Multiple Independent Contracts**

"An owner could choose to use a traditional approach, contracting with designers and builders independently but still use some of the aspects of IPD.

Liability- Unless limitations or transfers of liability are in the contract, each company is liable for its own work and the responsibility is compartmentalized in its own silo of risk and responsibility. Again, as noted above, there also may be clauses (with untested enforceability) that each of the companies sign to limit their ability to sue one another. Dispute resolution provisions can be put in place" (Thomsen, et al., 2010, p. 86).

3.6.2 **Joint Venture**

"Joint venture" is a broad term with shaded nuances in different industries. In the construction industry a JV normally implies a partnership between two or more organizations that combine their resources to do a specific project or program. Normally, there are two contracts. The JV has a contract with the owner that

spells out its duties and responsibilities. And the members of the JV have a JV agreement among themselves that spells out their individual duties and responsibilities. The owner pays the JV for the work. The JV pays the members—after deducting JV costs (if any). Normally, the terms of payment to the members of the JV agreement should reflect terms of payment from the owner to the JV agreement. (For instance, if the owner-JV agreement is cost-plus, the JV can pay the members on a cost-plus basis. If the owner-JV agreement has a GMP or target price provision, the individual members of the JV should probably have GMPs or target prices in their agreement with the JV.).

Liability: Normally there is "joint and several" responsibility stipulating that each member of the JV is responsible to the owner for the entire work. If one party defaults, the remaining partners must assume its responsibilities. Consequently, the total assets of each member are on the line for the successful execution of the agreement. For this reasons, JVs between AEs and CMs are seldom used for either IPD arrangements or design-build: architects don't want responsibility for construction and contractors don't want responsibility for design. However, a unique approach is for a JV to do perform none of the work but subcontract design work to the AE and construction work to the CM. Each indemnifies the other. Each works at cost and provides a GMP for their respective responsibility to the JV. If work is done for less than the GMP, the savings accrue to the JV. The JV provides management and executive activities and holds the profit, contingencies and incentive fees to be distributed at a predetermined rate. Now, if the AE can think of ways to help the contractor, it improves the profit, contingency or award pool—and vice versa—certainly in the spirit of IPD. Most owners would not agree to contract with a JV that had no assets so if the approach in the paragraph above was used, it's likely that the owner would require corporate guarantees. However the AE could guaranteed the typical AE responsibility and the CM could guaranteed the typical construction responsibility to the JV and indemnify one another. Of course such indemnities is worth no more that the assets and insurance of the respective companies." (Thomsen, et al., 2010, pp. 88-89).

3.6.3 Limited Liability Company

Another possible legal structure would be for the Core Team to form a Limited Liability Company ("LLC") to build the project. The ownership of the LLC may be distributed to the IPD Core Team proportionate to the level of effort and cost of the services that each member of the IPD Core Team might provide—and therefore proportionate to the potential profit (or loss) of members. Or it could be distributed some other way, such as based on the party's ability to influence project outcome or the amount of risk assumed by a party. The members would agree to divide the work and subcontract it among themselves. The AEs design, the consultants provides consultation, the CMs manage and the

construction. Each prime company is reimbursed at cost or at any reasonable predetermined arrangement for their work. At the end of the project, the profits are distributed based on the division of ownership. Non-Core Team members would be contracted either directly to the LLC or subcontracted to prime companies**.**

Liability: If architects, engineers and constructors form an LLC to execute a project, their liability to the owner is limited. That may be in their interest but not in the interest of the owner. Unless the situation is exceptional, a well-informed owner would require corporate guarantees.

While owners an LLC enjoy limited liability for most of their business transactions, the protection is not absolute. State statutes differ, but an owner (either an individual or a company) can be held personally liable if she, he or it injures someone, guarantees a bank loan or a business debt, fails to manage employee withholding taxes properly, is intentionally fraudulent, illegal, or reckless or treats the LLC as an extension of his, her or its affairs. This last exception requires attention. If owners don't treat the company as a separate business, a court might decide that the LLC doesn't really exist, and the owners are doing business individually and are therefore liable for their acts" (Thomsen, et al., 2010, p. 91).

3.6.4 **Single Multi -party Contract**

Another possibility is a single, multi-party contract signed by each member of the Core Team (including the owner). Unlike traditional contracts that only define responsibilities to the owner, the multi-party contract defines the duties of each party to one another. The owner pays each party individually. The payment could be lump-sum or cost-plus, and there could be a target price or GMP. Often, there is a shared incentive plan.

Liability: In such an agreement, it is possible to define and stipulate the responsibilities and liabilities of each party within the context of an integrated team that defines liability to the owner. Some argue that by jointly signing an agreement that provides for pursuing a common project with some shared responsibilities and liabilities, the parties are forming a joint venture and would result in the team members being held jointly liable to a third party. In the spirit of shared responsibility so prevalent in IPD, it is likely that there would be much in the language of the agreements and the actions of the parties to support such an allegation. The debate has not been resolved, and so far no cases have addressed this issue" (Thomsen, et al., 2010, p. 87).

3.6.4.1 Single Multi-Party Contracts and Their Liability Provisions

According to (Post, 2010, p. 22), "the latest shift toward team-centric project delivery, in which the owner, architect and contractor sign a single contract, is still not consistently defined, understood or practiced, agree the experts" (p. 22).

Despite the custom nature of multi-party agreements, (AIA California Council, 2007), identified three general forms: Project Alliances; Relational Contracts; and Single Purpose Entities. "The difference between these contract types are their approach towards compensation, risk sharing, decision making, liabilities, and risk management approaches. Following provides a brief overview to the contract characteristics of each and their liability features:

1- Project Alliances- Project Alliances were developed to support oil exploration in the North Sea. To meet the challenges, the parties created a project structure where the owner guaranteed the direct costs of non-owner parties, but payment of profit, overhead and bonus depended on project outcome. This compensation scheme bound the parties to succeed or fail together. To reinforce Alliance teamwork, all significant decision were made by facilitated consensus and the parties waived any claim between them, except for willful default. Since their development by the North Sea oil industry, Project Alliances have been extensively used in Australia for large civil works and vertical construction, have seen continued use in the United kingdom, and are beginning to be adopted in the United Stated (AIA National & AIA California Council, 2007, pp. 33-34).

- *Liability*

"The Project Alliance participants agree to waive liability among each other except for willful default. Willful default does not occur unless a party abandons the project. For all practical purposes, there are no liability concerns within the Project Alliance. However, the Project Alliance, and its participants, are still liable for damage inflicted on third parties. Job site safety, structural collapse, or other liability concern must still be addressed. Standard liability insurance will generally be sufficient to address third party incidents, and the unified structure of a Project Alliance is well suited to Owner Controlled Insurance Plans (OCIP) or similar wrap-up policies. The insurances should, in all instances, be reviewed to identify potential coverage limitations, such as joint-venture exclusions, professional services exclusions, or limitations on coverage for construction level services (i.e. means and methods exclusions in professional liability policies.)" (AIA National & AIA California Council, 2007, p. 39).

2- Single Purpose Entities- A Single Purpose Entity (SPE) is a temporary, but formal, legal structure created to realize a specific project. The SPE can be a corporation, limited liability company, limited

liability partnership, or other legal form. In an integrated SPE, key participants have an equity interest in the SPE based on their individual skill, creativity, experience, services, access to capital or financial contribution. Typically, equity owners are paid for any services they provide to SPE. However, an additional element of compensation is tied to overall project success (AIA National & AIA California Council, 2007, pp. 33-34).

- *Liability*

"Participant liability to the SPE and to other participants is theoretically unlimited, but in practice is often adjusted by contract. Typically risk management tools are limitation of liability, consequential damage waiver, waivers of liability, and waivers of subrogation. Liability to third party is as allowed by law, both on behalf of the SPE and its participants. This is identical to the third-party liability existing on a conventional project.

Risk management in SPEs can be enhanced by broadened insurance coverage. Often, the broadened insurance is obtained through an Owner Controlled Insurance Program that may have expanded builder's risk, professional liability, and even delay in start-up operational risk coverages.

In addition to the risk management benefits, the broader insurance may make financing easier to achieve. However, these expanded coverages are available in negotiated policies, not off-the-shelf coverages, and their availability is subject to market conditions and the bargaining power of the project participants" (AIA National & AIA California Council, 2007, p. 40).

3- Relational Contracts- Relational Contracts are similar to Project Alliance in that a virtual organization is created from individual entities. However, it differs in its approach to compensation, risk sharing, and decision making. In a relational contract, the parties may agree to limit their liability to each other, but it is not completely waived. If errors are made, conventional insurance is expected to respond. Thus there is a measure of traditional accountability. Compensation structures have project-based incentives, but there may or may not be any collective responsibility for project overruns. Decisions are developed on a team basis, but unlike the Project Alliance, the owner usually retains final decision rights in the absence of team consensus.

Because the balance of accountability, risk and control in Relational Contracts more closely follows traditional project structures, they may be better suited to the needs and risk profiles of certain projects and participants. In addition, Relational Contracts may offer a transitional structure to a more completely integrated approach.

Relational Contracts are more common in other areas of commercial activity. Strategic alliances among commercial firms grounded on trust arrangements often proceed on a relational contracting basis. These combinations are governed more by personal relationships than by terms of formal contract" (AIA National & AIA California Council, 2007, pp. 33-34).

- *Liability*

"Within the project, parties are responsible for their own errors and omissions. This is a distinctive difference between Project Alliances, where intramural liability is waived, and relational contracts that retain individual accountability. As with SPEs, the extent of liability can be adjusted through indemnity, limitation of liability, waiver of consequential damages, waivers of liability to the extent of insurance coverage, and waivers of subrogation. In addition, if a project contingency is used, some portion of error and omissions risk can be absorbed by the project contingency fund. Liability to third parties is essentially unchanged by the relational contract project delivery approach.

Conventional insurance products are used by the participants in relational contract projects. Each participant purchases its own insurance, which protects it against its own liability. But the policies should be carefully reviewed against the services each party will provide" (AIA National & AIA California Council, 2007, p. 42).

Despite the subtle differences between different type of IPD contracts, in general, true IPD "relies on early involvement of key participants, collaborative decision-making and control, liability waivers among key participants and jointly developed and validated project goals" (Post, 2010, p. 23).

3.7 Risk Management Tools Addressing Liabilities in IPD contracting

"We usually develop a more comprehensive approach that categorizes types of damages into project outcome, project performance, builder's risk and third party claims. Project outcome risks are those related to cost and schedule and are mutually waived between the parties.

- *Waiver of consequential damages*

The least complicated risk management approach is a simple waiver of consequential damages. This prevents the owner, contractor or architect from seeking damages for delay. The mutual consequential damage waiver should apply to all consultants and subcontractors that are within the risk/reward sharing pool. Responsibility for delays is adjusted, at least to some extent, by the level of profit available for distribution(Ashcraft, N/A, pp. 22-23).

- *Limitation of liability*

Project participants can limit their liability to each other through including limitation of liability clauses in their contract. "Until there are IPD insurance products, the IFOA has a limitation of liability, which maintains insurance. Parties can pursue claims for conduct below the standard of care, says Lichtig" (Post, 2010, pp. 23-24).

- *Waiver of claims*

"Article 8.1 of the AIA C191 multiparty contract includes a waiver of claims and liability and lists a group of limited exception. Another model, AIA C195, sets up a "special purpose entity" for a project that effectively eliminates claims. Section 3.8.2.1. of the Associated General Contractors of America's Consensus Docs 300 provides a check-box option that might be considered a waiver of claims and/or liability, says Lichtig. However, it includes a traditional indemnity clause for personal injury and property damage, he says" (Post, 2010, pp. 23-24).

Another approach divides claims by time. Thus those claims between the parties that occur before completion are waived (generally cost and schedule), whereas those that occur after (generally non-conforming or defective work) are not (Ashcraft, N/A, p. 22).

- *Liability Waiver*

"Contractual provisions in the IFOA that eliminates, or significantly reduces, the ability of the IPD parties to sue each other for losses related to the project. The level and comprehensiveness of liability waivers is negotiated among the Core Team members during the Project Initiation Phase" (Duke, et al., 2010, p. 50).

- *Warranty or professional liability*

The risks associated with project performance (e.g. whether the roof leaks) are usually transferred to the service provider through either warranty or professional liability claims.

- *Insurance*

Purchasing insurance is another way to transfer the residual risk in a project to a third party (insurance provider).

- *Indemnification*

"Third-party claims, most often injured workers, are transferred by indemnification to the contractor, which is covered under their comprehensive general liability policy or an owner controlled insurance program (OCIP)" (Ashcraft, N/A, pp. 22-23).

- *Contingency*

Contingency is a reserve fund which is considered for potential risks should they occur in the project. "Under most multi-party contracts, the architect and contractor are paid on the basis of cost, plus some or all of their overhead and an agreed-upon profit, a percentage of which is at risk. The owner funds a contingency. If it is preserved, savings are shared with the team. If there is a cost overrun and the contingency is exhausted, team members fund it out of their collective profits up to limits set in the agreement" (Post, 2010, p. 24).

IPD is a new and evolving approach; the industry is still trying to figure out the most suitable contracting strategies compatible with IPD principles. Risk management strategies for IPD delivery approach is still a work in progress. One unsettled issue, according to (Ashcraft, N/A) is how to handle claims brought by or against third parties with one or more of the IPD participants. Ideally, these would be jointly defended and prosecuted by the project management team, but this is not easily done if the team member are liable to each other (or have indemnity obligations) related to the claim. If the claim is covered by an OCIP, it becomes easier to accomplish joint prosecution and defense of many third party claims" (p. 23).

Sometime, the risk management approaches that a liable party pursues might appear as potential risks to other participants in the contract especially if the risk management approach is a mean for transferring risk to another party. Therefore, it is important that each individual in the contract carefully consider potential risks.

3.8 Concluding Thoughts on the Effect of IPD on Liabilities

IPD contracts propose different approaches towards liability issues and risk management strategies. Joint liability typical to IPD approach requires a presence of high level of trust; and by its virtue it should enhance the level of collaboration among the project participants, as IPD ties individual's success to project success. The question remains as how fair it would be that one party is panelized for the mistake of the other party, and how easy it would be to assemble a team and get them committed to an IPD contract with joint liability provisions.

Although, a comparison between the IPD family contract and traditional contracts in terms of the liability issues seems to be difficult and not right without speaking of the two contract characteristics and their specifications; a general comparison of the two contract family at a macro level could be done. According to (AIA, 2008, p. 4), "liability is a function of the likelihood of an error and the size of the consequence should it occur" (p. 4). Some would say the IPD contracts with BIM application tends to unduly expose the designer as comes with BIM a liability implication for early specification, cost estimating, and overall management of the project. While this could be true, the contract terms and structure plays a significant role in mitigating such liability. As (AIA California Council, 2008), states this potential risk can be mitigated if IPD project and contract are properly organized. Furthermore, they add, that, "IPD tends to reduce risk, because it focuses the entire project team on finding and reducing errors. (In an IPD project, the contractor's profit will be at risk if the project is over budget or delayed.) But even if an error does occur, IPD projects generally limit project team members ability to sue other project team members for economic losses. Thus, this type of risk will generally be limited or entirely waived between owner, contractor and architect with similar waivers flowing through to sub-tier members" (AIA California Council, 2008, p. 4).

The study of the impact of IPD on liabilities of each contracting party is not within the scope of this study, and could be considered for future research. However, this dissertation will include some interview questions while developing the case studies to examine the impact of IPD on the traditional liabilities of each contracting party.

3.9 Risk Sharing Attributed to IPD

Risk sharing is the method through which identified risk is shared between two or more parties. A few examples of risk sharing method are joint venture arrangement, partnering, incentive strategies, cost/work-hour contract, where risk is usually shared through a formula that splits overrun and under-run between the contracting parties (CII, 1989). According to (Duke, et al., 2010), risk sharing is one of the core principles of IPD method and in fact is one major reason why the Architecture, Engineering, Construction (AEC) industry is now moving towards implementing the IPD method.

"Rather than simply shifting risk among each other, members of an IPD team typically agree in various ways to share risk and collectively manage it. By sharing risk, all project participants have a financial stake in effectively identifying and mitigating risks that in traditional projects would be 'someone else's problem', leading to a less risky project overall as well as a more equitable approach to risk management. When another's problem will have a direct impact on your bottom line, you are more likely to offer help in solving the problem – promoting an "all for one, one for all" culture with everyone trying to reduce risk in their own way. Collective risk management means less risk for the whole project.

IPD projects use many creative ways of sharing risks and fostering collective risk management. Three common approaches involve sharing the cost-savings or cost overruns against an estimated cost of the work, pooling some portion of the team member's profit and placing it at risk, and/or pooling contingency funds and sharing any amount remaining after project completion" (Thomsen, et al., 2010).

Compared to traditional delivery method, 'true' IPD offers a better opportunity of achieving equitable risk sharing and reducing the cost of risks. (AIA National & AIA California Council, 2007) argues that, "the increased interdependence of collaborative projects increases the number of parties relying on another party's contributions and who could potentially initiate a lawsuit. But the same interdependent web can reduce the likelihood and severity of loss. Exposure may increase, although true risk decreases". However, it is important to note that risk sharing is best suited for teams who have trust in each other and are collaboration.

In addition to sharing the risks, the IPD model seeks to share the rewards. Following are the chief tenets of IPD Risk Allocation:

- Collaborative Risk Allocation
- Development of risk sharing agreement early – conduct a risk allocation workshop as part of the Project Initiation Process

- Limit risk and provide upside to maximize the potential on the project
- Mutual Waiver of Consequential Damages
- Full Waiver of Subrogation
- Mutual Indemnification and Hold Harmless
- An Insurance Strategy that Works in Favor of the Project

In order for the IPD project to work well, parties should carefully understand the risks involved in the project and distribute/share them evenly/equitably among themselves. “Successful IPD demands building teams adopt a non-adversarial mentality” (Post, 2010, p. 22). Unfortunately, sometime the contractual risk management tools such as waiver of claims/liabilities, and waiver of consequential damages, if not used correctly, could become in the favor of one party in the contract and thus disturb the balance of risk distribution. In such case IPD essence and principles is damaged and will not work. For example, a full waiver of consequential damages almost never favors the owner.

Thus, recognizing the inherent risks shared by all parties and focusing on an equitable distribution of the risks and rewards is the big first step. The next step is to develop a contractual vehicle that embodies these tenets and creates performance incentives for the IPD team. This equitably drafted contract, coupled with the appropriate insurance strategy, should protect each team member and help break down the walls that have been created from decades of risk shifting (Duke, et al., 2010, p. 29).

3.10 **Contingency Structure in IPD**

Unlike traditional projects which have three different types contingencies: design, construction, and owner’s contingency, the IPD projects usually have two types contingency: 1. IPD contingency, 2. Owner’s contingency.

IPD contingency is a contingency source shared by the IPD team for the un-foreseen extra expenses occurred through the project resulting from the events not related to scope change, or owner’s interference. “The owner needs a contingency fund to cover elective scope changes and unforeseen events that are not the fault of the team, such as differing site condition, force majeure, and some governmental action” (Ashcraft, N/A).

When the compensation metric is a target cost, “contingency” is just the amount of risk buffer that allows the parties to be comfortable with the target price given the level of project definition and design development.

Comparatively, traditionally there is a tendency to put limits into contracts, such as GMP, that transfer risk from one party to another. But the person accepting the risk must then build a risk buffer (contingency) into the contract and the owner then pays for the risk whether or not it occurs.

Ashcraft presents various options for contingency structuring. The first option has no explicit contingency. The second and third considers an explicit contingency for the team; one integrates it as part of the target cost, and the other outside the target cost. The final one set aside the contingency which can only be spent by the owner if a defined contingency event occurs.

3.11 **Insurance Appropriate for IPD**

Currently, there is no insurance product specifically tailored to the risk profile of IPD projects. Traditional insurance packages and CIP insurance are being utilized for IPD projects. "An effective option for managing risk, incentivizing safe work habits and sharing risk and rewards through insurance products can be a Controlled Insurance Program (CIP). A CIP is a centrally Managed and Purchased Insurance Program for a Project or Project(s). The CIP insures the following risks:

- Workers' Compensation
- General Liability
- Excess/Umbrella Liability

This CIP, also known as a Wrap Up, can be purchased by the owner or the contractor. This must be discussed and decided very early on in the life of the project. There is a more laborious administrative requirement for the owner to purchase and manage the CIP. However, it is manageable by working with and selecting the appropriate underwriter. As the graphic below dictates, the use of a CIP simplifies the process with a single policy that covers all the players of the project team, guaranteeing the correct coverage is in place and eliminating the multi-tiered markups" (Duke, et al., 2010, p. 34).

"According to Consolidated Risk Solutions, a CIP can best be illustrated via an example of a capital project with a Construction Value (Hard Cost) of $100M or greater. Ideally, based on economies of scale on projects of this magnitude, the cost of a CIP will most likely be less than the insurance premium for general liability, workers compensation and excess liability provided through the multi-tiered Traditional Approach. Thus, by having all contractors and subcontractors identify/remove their insurance costs from their bids, the Sponsor of the program may reduce their overall costs while also enhancing their coverage by purchasing coverage/limits dedicated to their specific project (or projects)" (Duke, et al., 2010, p. 35).

"At the conclusion of the project, potential savings from the CIP may be .5%-1.5% (CV) based on safety performance. To encourage a safe, clean project that allows for efficient work, potential CIP savings may be used as an incentive for the IPD Team" (Duke, et al., 2010, p. 36).

- *The Professional Liability Policy- Project Specific*

"An important issue that needs to be addressed at the beginning of any construction project—especially an IPD project—is the professional liability arising out of project design and construction management services. Project-specific professional liability policies are negotiated as dedicated limits over a deductible and the policy term is from the beginning of design, through construction plus 3 to 10 years. The project policy automatically replaces the practice policy of each design team member because the professional policy purchased by most design firms excludes all projects insured by a project policy. A project policy may be procured by either the owner or the lead design firm, although the premium is normally paid entirely by the owner" (Duke, et al., 2010, p. 36).

"Design firms do carry their own professional liability insurance policies, but it has significant limitations from the owner's perspective, including the following:

Owners share the design firm's professional policy limit with many other firms. Professional liability policies have a single aggregate policy limit that applies to all liabilities and defense costs arising from current and past work of the insured. If there is a claim, the owner has to hope it is near the front of the line to be sure of adequate protection.

Protection is here today and gone tomorrow. Many professional liability claims arise well after project completion. An owner has to depend on a design firm to stay in business and continuously renew its insurance in order to have a policy against which to claim in the future.

The owner cannot be added as an additional insured. Most professional liability underwriters for design firms will not name the owner as an additional insured. If the owner is sued for a professional loss caused by the design firm, the indemnification clause in the owner/design firm contract may provide protection but the professional policy will not defend the owner.

Limitation of liability. Many design firms will not work without a limitation of liability equal to their fees and a waiver of consequential damages" (Duke, et al., 2010, p. 37).

"When facing the limitations of design firm professional liability insurance combined with typical contractual location of professional risk, an owner has two choices. They are:

Assume the professional risk that exceeds available insurance or existing contract terms.

Purchase a professional policy dedicated to the owner's project" (Duke, et al., 2010, p. 37).

"One of the most important advantages of purchasing a Project Specific policy is the single source of responsibility for claims. The two following graphs show the difference between the "Traditional Approach," where the owner elects to have each party provide its own Professional Liability Insurance policy, and the "Project Specific" approach, where each party is covered under one policy dedicated solely to a specific project" (Duke, et al., 2010, p. 38).

"When it comes to cost, there is a simple rule of thumb: The broader the coverage, the higher the cost. Therefore, all things being equal, project professional liability, whether secured by the owner, contractor, or design professional, tends to be the most costly alternative in terms of premium. The irony is, as with nearly all types of insurance, it could end up being least costly in the event of a catastrophic occurrence. Because the project specific policy is a different product and more uniformly covers the owner, the value of the premium cannot be compared as true apples to apples comparison" (Duke, et al., 2010, p. 40).

"In addition, nearly all the subcontractors will be required to carry their own Payment and Performance Bonds. Given that the work performed by the subcontracting team under the Construction Manager can total as much as 90% of the total construction line item, this bonding covers a great amount of the potential warranty and subcontractor default issues that could arise from your project" (Duke, et al., 2010, p. 40)

3.12 Conclusion

The IPD traits discussed in the chapter is summarized in **Table 3-5** and is used as a framework for determining the level of integration in IPD case studies, and the traits differentiating the IPD approach from a traditional delivery approach.

Table 3-5: IPD traits

IPD Characteristics		
Contractual Principles of IPD	Key participants bound together as equal	
	Shared financial risk and reward	
	Joint liability	
	Liability waivers between key participants	
	Fiscal transparency between key participants	
	Early involvement of key participants	
	Intensified early planning	
	Jointly developed project target criteria	
	Collaborative decision making and control	
Behavioral Principles of IPD	Mutual respect and trust	
	Willingness to collaborate	
	Open communication	
	Collaborative innovation	
	Honoring promises	
	Acting in the best interest of the project	
	Organization and leadership	
Legal Agreement	Transitional IPD with Multiple Contracts	
	Single multi-party contract	Relational contracts
		Single Purpose Entities
		Project Alliances
Catalyst to IPD	Lean techniques	
	BIM	
	Co-location of the team	
	Organization & leadership	
Traits differentiating IPD from a traditional delivery approach	Integrated team	
	Collaborative decision making	
	Concurrent process	
	Managing cost	

	Risk sharing
	Joint liability, liability waivers
	Compensation/Reward
	Communications/ Technology
	Agreements

CHAPTER 4 LITERATURE REVIEW ON TRUST

4.1 Definition of Trust

An extensive list of qualities of trust, or more accurately descriptors of trust could be generated from the literature, although there tends to be considerable overlap between the various lists. Coleman (1990, p. 78) defines trust as 'committing to an exchange before you know how the other person will reciprocate'. Sabel (1993, p. 1133) puts it more succinctly: 'trust is the mutual confidence that no party to an exchange will exploit another's vulnerabilities'. Morgan and Hunt's (1994) lists included, consistency, competence, honesty, benevolence and fairness; Kumar (1996) listed dependability, honesty, interdependence, openness and fairness; Clark and Payne (1997) offered integrity, competence, consistent/fairness, openness, respect shown; (Wood & McDermott, 1999) define trust as the willingness to rely upon the actions of others, to be dependent upon them, and thus be vulnerable to their actions. Thus, "trust always involves an element of risk, that a partner will abuse the trust placed in them. Where there is no vulnerability, there is no need for trust" (p. 5). (Ngowi & Pienaar, 2005, p. 268), describes trust with the following attributes: 1. it inherently involves uncertainty about the future, 2. it implies vulnerability, i.e. the risk of losing something of value. The magnitude of this potential loss from untrustworthy behaviour is typically much greater than the anticipated gains from trustworthy behavior, 3. it is placed in another whose behaviour is not under one's control, so each partner duly exercises partial influence over alliance outcomes" (p. 268).

4.2 Benefits of Trust

The sense of trust brings with it so many advantages; chief among them is the ability to cooperate and building a successful team /partnership. Gambetta (1988) and his contributors see trust as a precondition of co-operation because partners need some assurance that the other parties will not defect**.** "Researches in partnering have highlighted the importance of developing trust among construction partners to facilitate project success"(P. S.-P. Wong & Cheung, 2004, p. 437) & (P. S. P. Wong, Cheung, & Ho, 2005, p. 1045); since trust improves contracting relationship. "Fukuyama (1995) argues that transaction costs can be lowered by social capital and trust" (Wood & McDermott, 1999, p. 4). In construction, where collaboration among contracting parties is essential in order to accomplish sophisticated tasks that require multi-parties involvement, successful trust building within project team would certainly improve the project outcome.

4.3 Why Trust Building is an Important Factor in Large Complex Projects?

Trust plays a significant role in a complex project where there are a large number of professionals, specialists and contributors involved and thus collaboration is critical element for project success.

(Swan, McDermott, Cooper, & Wood, 2003) discuss why building trust is more critical in large complex project. They outline the importance of three trust attributes in large complex projects: 1. project participants' expertise/experience, 2. shared knowledge, and 3. effective communication and interaction to avoid conflicts.

1- Ability to rely on project participants' expertise- In a large complex project, there is a larger network of interdependencies and much greater need for parties to rely on each other's services to collaboratively deliver the project. Building of trust is required for successful collaboration.

2- Reliable shared knowledge- In a collaborative project, parties need to rely on the information provided by the other parties in the project. Thus it is important that people develop trust and communicate well throughout the project to ensure the information and knowledge is transferred effectively and correctly to the other person.

3- Effective communication and interaction to avoid conflict- Effective communication and interaction are trust attributes. People tend to communicate more effectively with those who trust; on the other hand, effective interaction and communication also promotes trust and mitigate potential conflicts.

4.4 Trust Development Stages

Trust is a dynamic attribute. It needs time to be built and it either grows or diminishes through time (P. S.-P. Wong & Cheung, 2004, p. 438). As (Swan, et al., 2003), says, throughout relationship, exchange partners gradually testing whether the other party is trustworthy (p. 3). Repeated fulfillment of communications through action and outcome creates trust. If people consistently prove themselves to be reliable they will be trusted (p. 8).

Trust is built up over a series of interpersonal encounters (Moorman et al 1993), in which the parties establish reciprocal obligations (Nooteboom 1992). This research describes three stages of trust development: 1. Trust initiation, 2. Trust perception/feedback, 3. Trust level adjustment.

- *Stage 1- Trust initiation*

Building of trust starts with the baseline level of trust, where people are prepared to put their faith on each other and start cooperation. According to (P. S. P. Wong, et al., 2005, p. 1045), trust cycle can be kick-started if construction partners put cooperation before competition and self-interest.

- *Stage 2- Trust perception/feedback*

At this stage, the exchange partner assess behavior of each other as it supports their initial promises. Initial trust would promote and improve if the parties have fulfilled or even exceed their initial expectations and promises. Thus according to (Rotter 1967), trust generation/promotion is associated with the honoring of promises by the other party.

- *Stage 3- Trust level adjustment*

This stage involves how each party makes adjustment to their judgment and behavior depending on their perceived level of trust worthiness of the other party. As (P. S.-P. Wong & Cheung, 2004), states "trust is dynamic and either growing or diminishing. Varying in intensity, this is the confidence in and reliance upon the prediction" (p. 438).

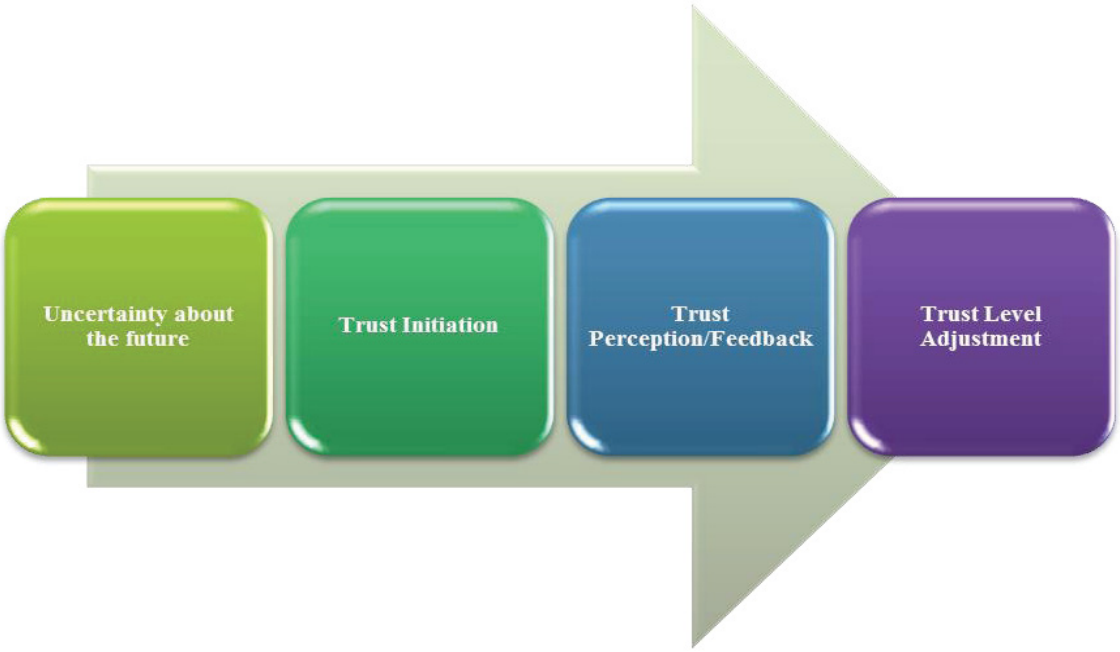

Figure 4-1: Trust development stage

4.5 Different Types of Trust

The review of literature on trust indicates different categories of trust. Among which, this research found the work done by (W. K. Wong, Cheung, Yiu, & Pang, 2008), one of the most comprehensive. (W. K. Wong, et al., 2008), discuss three major types of trust based on literature: 1. system-based, 2. cognition-based and 3. affect-based " (p. 821).

4.5.1 System-based Trust

"System-based trust focuses on formalized and procedural arrangements with no consideration on personal issues. These arrangements establish trust and strengthen the communication channel between people in the society. They play a remarkable role in effecting proper functioning of organizations and the development of organizational relationships. To develop system-based trust, organizational policy, communication system and contracts/agreements are considered as the three major attributes.

4.5.1.1 Organizational policy

Organizational policy specifies priorities and explains business procedures. It is a relevant indicator of an organization's value system. Organizational policy reflects the expected behavior of the staff and the trust they have in the organization.

4.5.1.2 Communication system

Communication system defines the channels for interactions of an organization. Such interactions can be identified as either close or distant contacts. Meetings, workshops or visits are examples of close contacts while emails, telephones, and teleconferencing are examples of distant contacts.

4.5.1.3 Contracts/agreement

Contracts and agreements define relationships and obligations between individuals and are regarded as another attribute of system-based trust because of their ability to reduce uncertainties, minimize, share or shift risks among contracting parties.

Contracts and agreements explicate implicit expectations and make obligations and rights visible. This contributes to fair risk allocation, overall project performance improvement and costs reduction. With these, building system-based trust becomes possible" (W. K. Wong, et al., 2008, p. 822).

4.5.2 Cognition-based Trust

"Cognition-based trust develops from the confidence built upon knowledge that reveals the cognitive bearings of an individual or an organization. The exchange of such knowledge can be attained by interaction or communication, formal and informal.

4.5.2.1 Communication/interaction

Communication/interaction is a means of imparting or exchanging information between individuals or organizations. Continuing communication and interaction facilitate organizational members to distribute, comprehend and obtain information that can be translated into meaningful knowledge. The absence of communication creates fears of exploitation and betrayal, which would result in avoidance of commitment to the team. Communication/interaction fosters mutual trust, which lays the foundation for growth in trust and business relationship.

4.5.2.2 Knowledge

Knowledge can be translated from information. Knowledge, such as track record, organizational role and financial status, reveals the consistency, competence as well as integrity of the individual or organization. This type of knowledge is critical in cognition-based trust development" (W. K. Wong, et al., 2008, p. 824). "Steven Covey makes it clear there are two key components for establishing trust: character and competency" (R. Miller, et al., 2009, p. 106).

4.5.3 Affect-based Trust

"Affect-based trust builds on a sentimental platform. It describes an emotional bond that ties individuals to invest in personal attachment and be thoughtful to each other. Although Boon and Holmes suggested affect-based trust development is restricted to romantic relationships, however it is believed that building up affect-based trust at work enhances the process of evaluation and information exchange, improves performance and well being of the teams. Therefore, being thoughtful and emotional investments are proposed to describe affect-based trust development.

4.5.3.1 Being thoughtful

Being thoughtful can be demonstrated by showing care and concern. It eliminates unfavorable attitudes and raises kind awareness of other people's feelings. Wright noted the reciprocal nature of thoughtfulness which makes it an effective ingredient for improving work relationships and developing affect-based trust.

4.5.3.2 **Emotional investment**

Emotion is an affective state of consciousness often actuated by personal feelings. It is a mental state that happens spontaneously instead of through cognitive or volitional effort and is often accompanied by physiological changes. The attempt of an individual to make emotional investment illustrates his enthusiasm on spending time, energy and effort on a person that he thinks is good or helpful. Therefore, an individual's willingness to invest his emotions on others demonstrates affect-based trust building. Affect-based trust derived from emotional investments reduces defensiveness, unhealthy competitiveness and disruption, eliminates frictions and enhances team spirit and morale in working relationship" (W. K. Wong, et al., 2008, p. 824).

4.6 **Bases for Trust Establishment**

In their earlier studies on 2004, Wong & Cheung (pp. 438-439) discuss three bases of trust according to Hartman who explain why people place their trust on another party. The three bases are competence trust, integrity trust and intuitive trust.

Competence trust is based on the perception of others ability to perform the required work. Partner's competence trust can be gained by observable proofs like track record, experience or connections with professional bodies. In this sense competence trust can be categorized under cognitive-based trust according to their current categories presented above.

Integrity trust: Integrity trust (or ethical trust) is based on the perception of others willingness to protect the interest of their counter parts over the construction project. The level of integrity trust is highly affected by the values, morals, ethics and cultural backgrounds of the parties. Generally, establishing open communication is critical to enhance or gain partners_ Integrity trust.

Intuitive trust: Intuitive trust (or emotional trust) is founded upon the party's prejudice, biases or other personal feelings towards the counter parts. The Intuitive trust is the perception which is hardly affected by the instant performance of the parties but the long-term relationships among them.

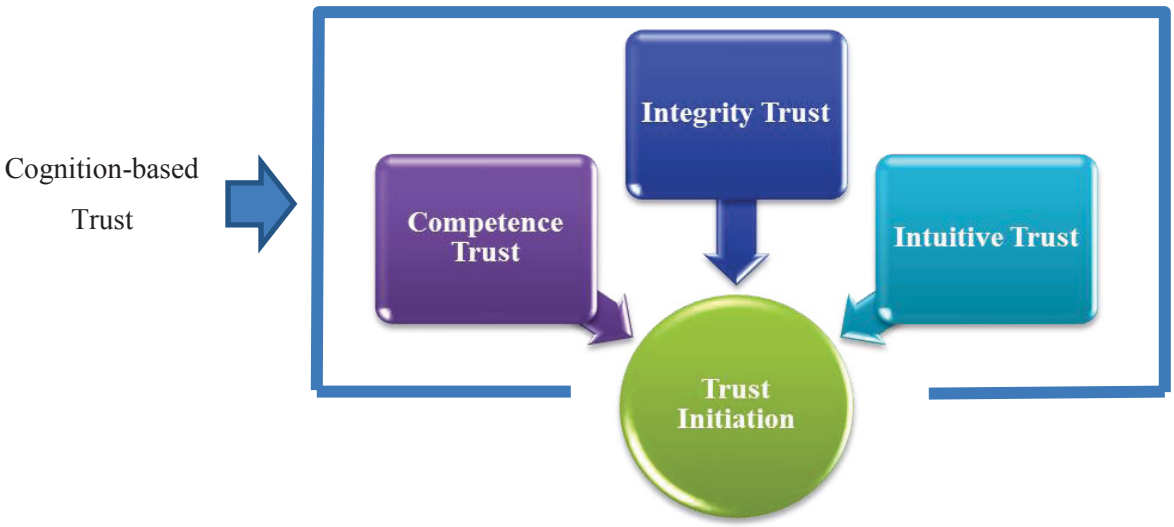

Figure 4-2: Bases for trust establishment

4.7 Bases for Trust Promotion

(P. S.-P. Wong & Cheung, 2004), conducted a research to investigate the relative importance of each major trust type on the partnering success. In their studies, they collected data from two groups of respondents: 1. clients and consultant and 2. contractors. The result of their studies indicate that according to clients and consultants responses, System-based trust is the most important trust factor contributing to building trust and achieving partnering success. This indicates that they rely strongly on satisfactory contract terms to enhance trust. The contractors responses also identify system-based trust as the most important factors, however, they also identify Partners' Performance and Permeability closely as critical in contributing to building trust and achieving partnering success. This suggests that "the sensitivity of contractors towards trust level is strongly affected by both the system in place as well as the performance of its counterpart" (P. S.-P. Wong & Cheung, 2004, p. 445).

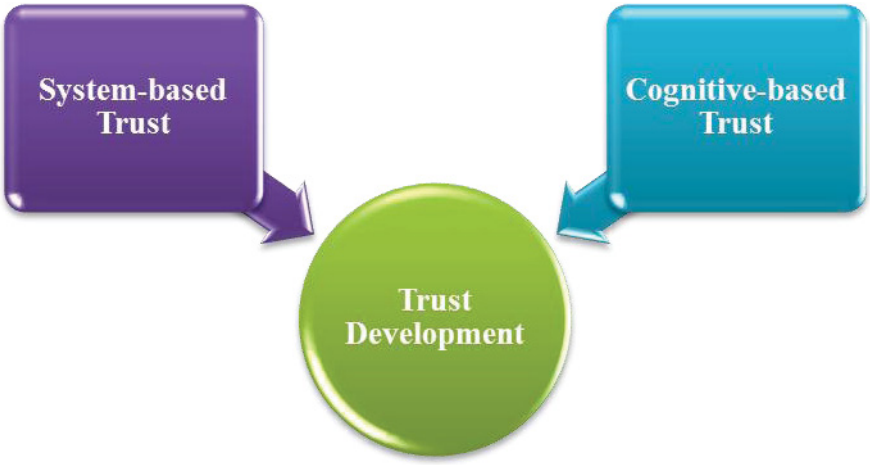

Figure 4-3: Bases of trust development

4.8 Influential Factors Promoting Trust

(Swan, et al., 2003), presents six factors essential in building of trust as follow: 1. experience; 2. Working together; 3. problem solving; 4. Shared goals, and an understanding of individual companies goals; 5. reciprocity and support for each other's trusting behavior; 6. Reasonable behavior" (Swan, et al., 2003, p. 1).

(P. S. P. Wong, et al., 2005), lists fourteen trust attributes. According to their studies, following are the factors affecting the trust level of construction partners: 1. Competence of work (competent); 2. Problem-solving ability (problem solving); 3. Frequency and effectiveness of communication (communication);4. penness and integrity of communication (openness); 5. Alignment of effort and rewards (alignment); 6. Effective and sufficient information flow (information flow); 7. Sense of unity (unity); 8. Respect and appreciation of the system (respect); 9. Compatibility; 10. Long-term relationships; 11. Financial stability; 12. Adoption of ADR techniques; 13. Reputation; and 14. Satisfaction of contract terms and agreement (satisfactory Terms) (pp. 1046-1047).

Through a combinatorial approach, this research extracts from literature the factors that affect building of trust; aggregates them and categorizes them under the structure proposed by (W. K. Wong, et al., 2008) which discussed earlier.

Table 4-1 presents the trust factors contributing to building trust.

Table 4-1: Trust-building framework in construction contracting

Trust Type		Trust attributes
System-based	Organizational policy/ Team building strategy	1. Team building
		2. Create sense of belonging
		3. Set mutual /shared goals
		4. Clearly defined policy about time, cost, risks…
		5. Shared similar culture and value
		6. Authority to make decisions
	Communication system	7. Establish effective communication procedure
	Contracts and agreements	8. A clearly defined contract/ Clearly define roles and responsibilities
		9. Contract form
		10. Fair/Equitable agreements or contracts terms
		11. Alternative dispute resolution
		12. Alignment of effort and reward
		13. A balanced risk/reward sharing
Cognition-based	Interaction/ Behavior	14. Promote work related interaction
		15. Open and honest communication/ permeability
		16. Behavior and interaction of partners: Reciprocity
		17. Information sharing
		18. Honoring promises
		19. Collaboration
	Knowledge/ Competencies/ Reputation	20. Competence/ Experience/Performance/ Problem solving
		21. Financial stability
		22. Good reputation/ Experience
	Macro-Economic factor	23. Macro-Economic condition
Affect-based	Being thoughtful	24. Mutual understanding/showing care
		25. Taking into consideration the needs of each other
		26. Mutual respect and appreciation
	Emotional intelligence	27. Develop personal relationship
		28. Long term relationship

1. Team Building: According to (Swan, et al., 2003) team building is a basis for building trust. Team building is a critical component in an environment where collaboration is critical to project success. (Swan, et al., 2003, p. 19), discusses the need to quickly build teams and establish clear and honest communications for developing trust (p. 19).

2. Create sense of belonging: Trust is more easily developed between the parties that are associated/affiliated with each other. "Sufficient organizational resources in response to contracting parties' needs increase the sense of belonging to the organization "(W. K. Wong, et al., 2008, p. 825) and in turn increase the trust level.

3. Set mutual /shared goals: "Shared goals mean that everyone can be seen to fulfilling a joint task, rather than viewing their own role as separate from the rest of the project team" (Swan, et al., 2003, p. 9).

Thus mutual and shared goals better align the parties as a team, increase the sense of corporation and motivate the parties to help their counterpart in achieving their common goals. (Ngowi & Pienaar, 2005, p. 276), also suggest shared and mutual goals as factors influencing building of trust.

4. Clearly defined policy about time, cost, risks…: Organization policy should be clearly specified for solving time, cost, risk, and safety issues to avoid confusion, misunderstanding and conflicts which leads to mistrust.

5. Shared similar culture and value: Shared similar culture and value promotes mutual understanding and collaboration among contracting parties. (Ngowi & Pienaar, 2005, p. 276) and (P. S. P. Wong, et al., 2005, p. 1046) suggest parties to seek (a) partner(s) with complementary capability and possibly same culture. Swan, et al., 2003 put emphasize on the culture of a company and the values that are important to the company, as it greatly impacts the behavior of the employees (p. 13).

6. Authority to make decisions: When people are empowered and have authority to make decisions they feel they are trusted. "Effective teams are built when people have authority to make decisions. If an organisation does not trust it's own people, its ability to build trusting relationships with other companies can be severely hampered" (Swan, et al., 2003, p. 5).

7. Establish effective communication procedure: Effective communication system enhances the interaction between the parties which in turn facilitate sharing of information. Trust tends to develop between parties who communicates effectively and share knowledge with each other. (Ngowi & Pienaar, 2005, p. 276) & (W. K. Wong, et al., 2008, p. 825) discuss the importance of setting up an effective communication procedure in developing trust across a team.

8. A clearly defined contract/ Clearly define roles and responsibilities: Contracts and agreements form the basis of the relationships that many individuals enter into(Swan, et al., 2003, p. 16).

A clearly defined contract document clearly outlining roles and responsibilities brings confidence and comforts to all" (W. K. Wong, et al., 2008, p. 825) & (Ngowi & Pienaar, 2005, p. 276), eliminates misunderstanding, confusion, and potential conflicts and ultimately influence the ability of parties to form trusting relationships.

9- Contract from: "Contract form could be seen as a factor influencing the development of trusting relationships. Traditional approaches may be seen as supporting the adversarial approach to construction projects. Partnering is seen as a useful instrument for building trust in project teams…Partnering, although useful in promoting trust is not the only form of contracting in which trust can be built" (Swan, et al., 2003, p. 16). Integrated Project Delivery (IPD) is an approach built around the idea of collaboration, integration and thus if implemented correctly shall promote trust.

10. Fair/Equitable agreements or contracts terms: "Equitable agreements or contracts terms can help the contracting parties to establish trust and sustain cooperation since their perceived benefits are secured" (P. S. P. Wong, et al., 2005, p. 1046).While un-equitable and un-fair contract cause conflicts and makes the participants to put their self interest ahead of projects interest, it also promotes competition as opposed to cooperation.

Eliminate conflicts- For trust to be built it is important that all parties involved feel they are getting fair reward for the work they are putting into the project. If the profit level is equitable and, in some cases protected, then the partners do not feel the need to squeeze more profit through the use of claims, variations and day rates" (Swan, et al., 2003, p. 16).

Eliminates competition among contracting parties-"According to (Ngowi & Pienaar, 2005), asymmetrical stakes lead to a weak-form trust characterized by a vigorous pursuance of private operation (competition aspect), while equal stakes lead to a strong-form trust with exchange partners focusing more on the common activities of the alliance…Equal stakes in the alliance appears to reassure each fi 2 that the partner can be trusted with the task of delivering the complementary capability" (p. 276).

As discussed earlier in studies conducted by (P. S.-P. Wong & Cheung, 2004, p. 437), satisfactory system-based trust especially contract terms is identified as one of the most important trust factors.

11. Alternative dispute resolution: "The use of alternative dispute resolution and satisfaction on the contract terms are also trust attributes in construction partnering."(P. S.-P. Wong & Cheung, 2004, p. 439).

12. Alignment of effort and reward: "Benefits received should be fair and match the input efforts" (P. S. P. Wong, et al., 2005, p. 1046).

13. A balanced risk/reward sharing: A balanced risk/reward structure where everybody lose together or win together promotes collaboration and trust among the parties.

14. Promote work related interaction: Interaction between the parties not only gradually establishes a bond between them but also promotes mutual understanding between individuals (W. K. Wong, et al., 2008, p. 825). Trust development is facilitated through interaction, communication, and when parties recognize the challenges and condition of each other and reach mutual understanding.

15. Open and honest communication: "Open and honest communication enables more work related information exchange between individuals" (W. K. Wong, et al., 2008, p. 825). People tend to trust each other when their counter parts is open and honest in sharing information.

(Swan, et al., 2003), explain that trust is concerned with the way people communicate with each other. To establish and develop trust, people had to be open, willing to share important information with the rest of the team, and be honest, giving information that reflected the real situation (p. 3). "If the communication is good within a project team they may quickly identify the problems and move to solving them" (p. 11).

According to (P. S. P. Wong, et al., 2005, indicates "Permeability" as one of the most critical factors in building trust. "Permeability" reflects the partner's openness in sharing information. They argue that "the contractor is in a position to initiate trust through competent performance and maintaining effective communication with the client. In this manner, the trust cycle can expand with reciprocal trustworthiness from the client". They further argue that "performance" and "permeability" of partners are the two most critical trust factors (p. 1045).

16. Behavior and interaction of partners: Reciprocity: How partners in the supply chain behave towards one another is important in developing the relationship of trust that underpins successful integrated teams. Reciprocity means that if individuals had put themselves out for their counterparts, making sacrifices to make the other peoples' lives easier on the project, then it is important that the favors are returned. "Failure to do reciprocity can stop a relationship before it starts" (Swan, et al., 2003, p. 10). "'Mutual trust' has been found to be one of the most important success factors in maintaining partnering

relationship. Studies indicate that the trust level between the client and contractor grows if trusting acts can be reciprocated" (W. K. Wong, et al., 2008, p. 822).

17. Information sharing: Information sharing, such as exchanging organizational strategies or confidential information, is the essential trust-builder. Appropriate and honest information sharing can optimize mutual understanding and expectations among the partnering members (W. K. Wong, et al., 2008, p. 822).

18. Honoring promises: Honoring promises and accomplishing goals are are often used by parties to gauge the trustworthiness of each other (McGeorge and Palmer 2000) (P. S. P. Wong, et al., 2005, pp. 1046-1047).

19. Collaboration: In the book collaborative way, the authors outlines five commitments required by team members to establish a collaborative environment: 1. Listening generously, 2. speaking straight, 3. Being for each other, 4. honoring commitment, and 5. Acknowledgment/appreciation. Collaboration sets the stage ready for developing trust.

20. Competence/ Experience/Performance/ Problem solving: People are more likely to trust those individuals who are competent (Swan, et al., 2003, p. 3). According to the research conducted by Wong, et al., 2005, performance is one of the most critical trust factors. Performance describes the partner's the competence, achievement of project targets and problem-solving speed and ability as perceived by their counterpart. (Ngowi & Pienaar, 2005, p. 276) & (P. S. P. Wong, et al., 2005, p. 1046) suggest adopting a joint problem solving philosophy in the effort to building trust.

21. Financial stability: "Financial stability is one of the factors in evaluating a company's reliability" (W. K. Wong, et al., 2008, p. 825). Swan, et al., 2003, discuss the effects financial position of a company might have on how its personnel behave on a project (p. 13).

22. Good reputation: "For many of the interviewees reputations were important indicators of who could be trusted, which is why many companies regarded their reputations as an important intangible asset" (Swan, et al., 2003). People have more confidence to work with individuals with a good reputation of being honest. (W. K. Wong, et al., 2008, p. 825).

23. Macro-Economic condition: According to some interviews conducted by Swan, et al., 2003, the buoyant nature of the market creates a strong base for building trusting relationship. In a buoyant market, contractors are winning work with a workable profit margin and are therefore less likely to get themselves in to a commercial position in which claims need to be pursued. In difficult market conditions price

competition may become more intense and give rise to contractual arrangements that put contractors under pressure to squeeze out extra profit (p. 18).

24. Mutual understanding/showing care: This implies that the project team understands the position of other members of the project team, or their individual or organizational goals, and appreciating the requirements and difficulties they may experience" (Swan, et al., 2003, p. 9).

Showing care and concern towards each other creates the sense of unity and friendship, makes parties feeling more comfortable working with each other and establishes trust (W. K. Wong, et al., 2008, p. 825).

25. Taking into consideration the needs of each other: Taking each party's need into account in decision making process promotes the team environment, creates sense of belonging and encourages a compromising and satisfactory outcome (W. K. Wong, et al., 2008, p. 825).

26. Mutual respect and appreciation: Mutual respect and appreciation, according to (P. S. P. Wong, et al., 2005, p. 1046), is also create a friendly and positive environment for collaboration.

27. Develop personal relationship: "Having a good personal relationship with the other party may also improve working relationship with him/her" (W. K. Wong, et al., 2008, p. 825)."Spending appropriate time, energy and effort to understand other party's personal details and work background eliminates friction between each other at work" (W. K. Wong, et al., 2008, p. 825).

28. Long term relationship: Long-term relationships can create special bond between the parties and help develop new and better ways of working together. (W. K. Wong, et al., 2008, p. 825) emphasizes that parties in a long term relationship knows better how to communication with each other. Furthermore, people who know each other for long time do not put their judgment only based on the action of their partners at the point of time as they have developed relationship over time and have established trust with each other.

4.9 Factors Eroding Trust

Any event that negatively impacts building of trust can be included in the list of factors eroding trust. Items listed in

Table 4-2 are the opposite of items listed in

Table 4-1 and thus represent the factors eroding trust in construction contracting.

Discussing each elements of the framework is unnecessary, however, few factors is highlighted in the following section as there appears to be more emphasis on them in the literature.

Not fulfilling obligations through time: Trust easily diminishes when people do not fulfill their obligations or tell lies (Swan, et al., 2003, p. 11).

Rigid flow of communication: The rigid flow of communication often found in traditional approaches create problems" (Swan, et al., 2003, p. 11).

Finger pointing/Blaming culture: Trust is broken down when the team has the culture of finger pointing and blaming each other when a problem arise as opposed to looking for solution(Swan, et al., 2003, p. 8).

Asymmetrical/ un-equitable risk allocation: "Asymmetrical stakes lead to a weak-form trust characterized by a vigorous pursuance of private operation (competition aspect), while equal stakes lead to a strong-form trust with exchange partners focusing more on the common activities of the alliance" (Ngowi & Pienaar, 2005, p. 276).

Table 4-2: Factors eroding trust in construction contracting

Trust Type		Trust attributes
System-based	Organizational policy/ Team building strategy	1. Individual oriented
		2. No sense of belonging
		3. Different individual goals
		4. Vague policy about time, cost, risks…
		5. Different and contradicting culture and value
		6. No authority to make decisions for some parties
	Communication system	7. Ineffective communication procedure
	Contracts and agreements	8. Unclear contract/ unclear roles and responsibilities
		9. Contract form
		10. Un-equitable agreements or contracts terms
		11. Absence of dispute resolution
		12. Misalignment of effort and reward
		13. Asymmetrical/ un-equitable risk allocation
Cognition-based	Interaction/ Behavior	14. Absence of work related interaction
		15. Rigid flow of communication
		16. Behavior and interaction of partners: Unreciprocated
		17. Isolated Information
		18. Not fulfilling obligations through time
		20. Finger pointing/Blaming culture
	Knowledge/ Competencies/ Reputation	20. Competence/ Experience/Performance/ Problem solving
		21. Financial instability
		22. Bad reputation
	Macro-Economic factor	23. Macro-Economic condition
Affect-based	Not being thoughtful	24. Lack of mutual understanding
		25. Self-centered and not taking into consideration the needs of each other
		26. Having no mutual respect and appreciation
	Emotional un-intelligence	27. No personal relationship

CHAPTER 5 RESEARCH METHODOLOGY

The research methodology includes literature review and analysis, expert panel discussion, and case studies development. The research approach involves the following steps:

- *Literature Review*

1) conducting a comprehensive literature review on the subject of Project Delivery and Contracting Strategies (PDCS), and Integrated Project Delivery (IPD) approach
2) conducting a thorough literature review on the subject of trust in construction contracting

- *Literature Analysis*

3) developing a Project Delivery and Contracting Strategies (PDC) framework
4) developing trust-building framework

- *Expert Panel*

5) conducting a pilot study with an industry expert panel (focus group) to define IPD, identify key factors in selecting the IPD cases, define units of analysis for contract provisions, units of measure for trust, and to validate the PDCS and trust-building frameworks

- *Case Studies*

6) reviewing and analyzing the contract documents using the PDCS framework
7) developing a semi-structured interview questionnaire based on the literature review analysis, expert panel discussion, and the contract documents.
8) conducting individual interviews with the key IPD players.
9) transcribing the interviews voice records
10) performing thematic coding analysis: content analysis, deriving themes, and categorizing contents under each themes

- *Conclusion*

11) integrating the results of literature review and case study chapters and performing content analysis
12) outlining concluding results on IPD approach, comparative analysis of IPD and a traditional delivery approach, factors facilitating establishment of trust, factors promoting trust, IPD and

trust correlation, and comparative effectiveness of IPD versus a traditional delivery approach on trust.

5.1 Literature Review

Literature review conducted throughout two stages: 1. Pre-proposal stage, and 2. Proposal stage. In the pre-proposal stage the focus of literature review was "Project Delivery and Contracting Strategies (PDCS)" and "PDCS Selection Tools". The outcome of literature review and analysis of this stage led to the development of a Project Delivery and Contracting Strategies (PDCS) framework. See Figure 5-1.

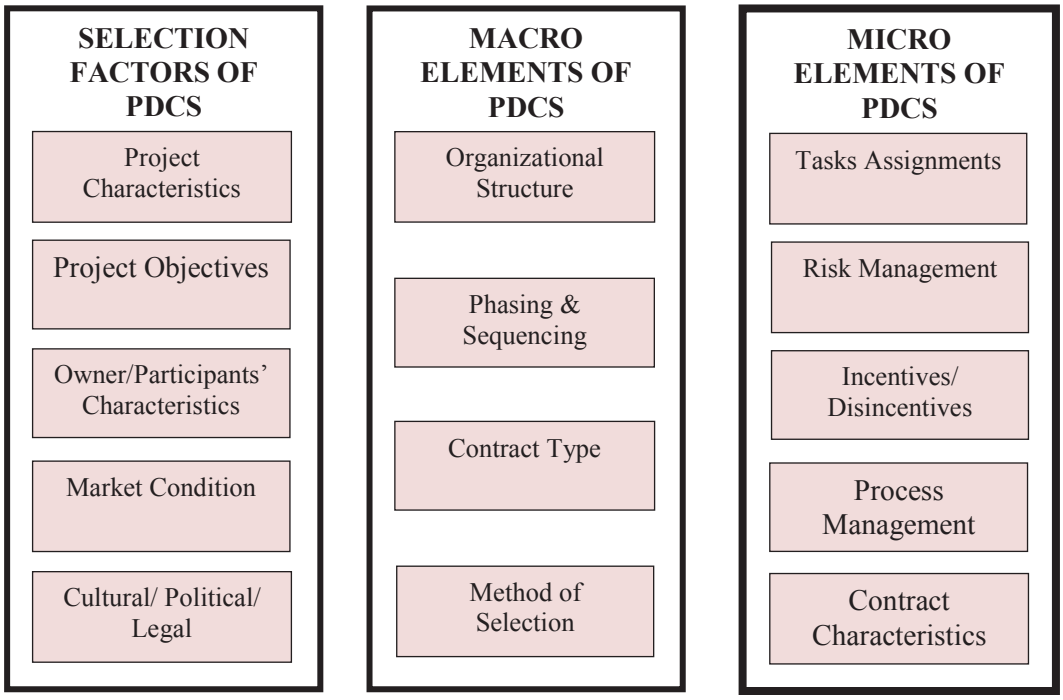

Figure 5-1: Project Delivery Contracting Strategies (PDCS) Framework

The PDCS Framework contains three key categories: 1. Selection factors leading to the choice of a particular PDCS, 2. Macro elements of PDCS forming the general features of a PDCS, and 3. Micro elements of PDCS including the more detailed contractual characteristics of PDCS. The PDCS framework serves as an organizational baseline for structuring the case studies and acquiring the information related to the employed PDCS in the projects.

In the Proposal stage, the focus of literature review was "Integrated Project Delivery (IPD)" and "Trust-building Attributes".

The outcome of literature review and analysis on "IPD" includes textual information on the following:

1. Definition of IPD
2. Comparison of IPD and lean
3. Traits differentiating IPD from a traditional delivery approach
4. IPD contractual agreements and their liability provisions
5. Risk management tools addressing liabilities in IPD
6. Risk sharing, contingency, and insurance strategies attributed to IPD approach

The outcome of literature review and analysis of on "Trust-building Attributes" led to the development of Trust-building framework (Table 5-1).

Table 5-1: Trust-building framework in construction contracting

Trust Type		Trust attributes
System-based	Organizational policy/ Team building strategy	1. Team building
		2. Create sense of belonging
		3. Set mutual /shared goals
		4. Clearly defined policy about time, cost, risks…
		5. Shared similar culture and value
		6. Authority to make decisions
	Communication system	7. Establish effective communication procedure
	Contracts and agreements	8. A clearly defined contract/ Clearly define roles and responsibilities
		9. Contract form
		10. Fair/Equitable agreements or contracts terms
		11. Alternative dispute resolution
		12. Alignment of effort and reward
		13. A balanced risk/reward sharing
Cognition-based	Interaction/ Behavior	14. Promote work related interaction
		15. Open and honest communication/ permeability
		16. Behavior and interaction of partners: Reciprocity
		17. Information sharing
		18. Honoring promises
		19. Collaboration
	Knowledge/ Competencies/ Reputation	20. Competence/ Experience/Performance/ Problem solving
		21. Financial stability
		22. Good reputation/ Experience
	Macro-Economic factor	23. Macro-Economic condition

Affect-based	Being thoughtful	24. Mutual understanding/showing care
		25. Taking into consideration the needs of each other
		26. Mutual respect and appreciation
	Emotional intelligence	27. Develop personal relationship
		28. Long term relationship

The above literature-based charts were developed through a combinatorial approach, content analysis, deriving codes, themes, and titles, and putting the contents under each category. The literature review continued until arriving at a saturation point, where no more new category can be merged.

5.2 **Expert Panel**

Following the completion of literature review, an expert panel was formed to further incorporate the current industry's perspectives and experiences with IPD. Following are the subjects of discussion with the expert panel: 1. Definition of IPD, 2. Influential factors promoting trust, 3. Units of measure for trust, 4. Units of analysis for the project delivery and contracting approach, 5. Finding IPD projects as case studies for this research.

The expert panel is composed of high level executive professionals of leading companies in the construction industry as well as academics. The participants of the panel are as follow:

Industry professionals

1. Senior Vice President of a Project Management Company
2. Principal, Project Construction Management & Real Estate Company
3. CEO, Mechanical & Electrical Construction Company
4. Executive Vice President, Construction Corporation
5. President, COO, Construction Management Company
6. President, Insurance Company
7. Region CEO, Construction Management Company
8. Senior Vice President, Engineering and Fabrication Company

Academics

9. Yvan J. Beliveau, Ph.D., P.E.
10. Kihong Ku, DDes
11. Andrew P. McCoy, Ph.D.

5.2.1 IPD Definition

The panel was asked to debate on the definition of "Integrated Project Delivery (IPD)" approach. Pardis Pishdad-Bozorgi, the author of this dissertation indicated that IPD is distinguished by early involvement of key participants, shared risks/rewards, and single multi-party contract. The panel however, came to a consensus that there are IPD approaches that implement multiple two-party contracts in addition to an IPD agreement. The panel argued that having a single multi-party contract should not be a "must-have" condition for an IPD approach. They collectively agreed that single multi-party contract represents a pure form of IPD approach. Thus, following the recommendation of the expert panel and literature review this research defines IPD as follow:

IPD is a spectrum of integrated approaches and not a single delivery or contract type. Like other project delivery methods, IPD may appear in different varieties of contract type. Please see Figure 5-2. The IPD spectrum starts with the delivery approaches that follow the IPD goal of eliminating waste and maximizing efficiency and value, share risks and rewards to some extent, has a joining/bridging agreement in addition to its multiple contracts, and adapt the IPD contractual and behavioral principles. The other end of the IPD spectrum is the purest form of IPD with a single multi-party agreement.

Figure 5-2: IPD spectrum

There are numerous variations of IPD approach throughout the IPD spectrum depending on the applied contractual, principles, the implemented contract type, and the employed catalyst methods to IPD. As illustrated in Table 5-2, shared financial risks and reward, and the presence of either a multi-party contract or a joining or bridging agreement are the required features of an IPD contract. Other elements further define the level of integration of an IPD process.

Table 5-2: Variables defining IPD characteristics

Type of Variables	Variables Defining the Level of Integration in IPD	Absolutely Required to be Considered IPD
Contractual Principles	Shared financial risks and reward	x
	Liability waivers	

	Fiscal transparency between key participants	
	Early involvement of key participants	x
	Intensified early planning	
	Jointly developed project target criteria	
	Collaborative decision making and control	
Relational Contract Type	Single multi-party contract	x
	Multiple contracts with joining/bridging agreement	
Catalyst to IPD	Lean techniques	
	BIM	
	Co-location of the team	
	Organization & leadership	

5.2.2 Influential Factors Promoting Trust

The expert panel was also asked to describe the circumstances that are influential in building and promoting trust-based relationships. The discussion verified the trust-building framework developed thru literature and indicate that the framework is complete and comprehensive.

5.2.3 Units of Measure for Trust

The panel believed units of measure for trust is the individuals' perception on the level of trust. Pardis suggested to also utilizing the trust-building attributes as listed in Table 4.1 to measure individuals' perception on trust. The panel agreed and approved the approach.

5.2.4 Units of Analysis for Contract

For the units of analysis for the contract, one of the panelists suggested the following criteria:

1. Decision making
2. Target cost, compensation
3. Changes in contingencies
4. Risk allocation
5. Document and record control
6. Dispute resolution

The author presented the Project Delivery Contract Strategies (PDCS) framework that she developed through literature review and analysis and suggested to use that framework as the framework also includes the criteria suggested by one of the panelist.

The panel verified the PDCS framework and agreed with the use of framework as the units of analysis for contract.

5.2.5 Finding Case Studies on IPD

Lastly, the panel was asked to suggest potential IPD project as case studies for this research. The result was the "Project One". Further efforts conducted to find case studies include: 1. Posting an announcement at the Lean Construction Institute (LC) website, 2. Making announcement at the industry board meeting of the Myers-Lawson School of Construction at Virginia Tech, 3. Sending out emails to personal contacts. The second Case Study, "PROJECT TWO", was suggested by a senior representative with PM Company.

5.3 Case Studies

Case-study methodology was found to be the most suitable approach for conducting this research. As the research has an exploratory nature and the research questions ask about 'How': "the goal of this Ph.D. research is to closely explore the IPD contractual strategies, to highlight the comparison results of IPD and conventional approaches, to analyze how trust-based relationships are established and promoted, and to demonstrate how trust and IPD contractual principles correlate".

"As Yin (2009) suggests, case study is a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence" (Robson, 2011). In this sense, case study appears to be a right approach to study IPD, a contemporary and evolving delivery approach. Multiple sources of evidence includes two projects in IPD.

5.3.1 Triangulation

This research developed two case studies on two IPD projects: 1. "Project One" ("PROJECT ONE"), and 2. "PROJECT TWO". The two case studies represent different level of integration. "PROJECT ONE" utilizes single multi-party agreement and "PROJECT TWO" utilizes multiple two-party contracts with an additional IPD agreement which is signed by all key IPD parties.

Triangulation strategy is used to enhance the rigor of the research. "Data triangulation involves using more than one method of data collection (e.g. interviews and documents). Triangulation can help to counter all of the threats to validity (Robson, 2011).

The case studies were developed based on the information gathered thru the agreements, and one-on-one interviews with key project participants (Owner, Architect, Contractor, and Project Manager). The interviews were conducted utilizing a questionnaire, were recorded, transcribed, and analyzed.

The case studies present the following information:

5.3.2 Introduction to the Projects

Each case study starts with an overview to the general project information, such as scope, schedule, and budget information. These information are mostly captured through the contract agreement(s). Below is a brief summary of the selected projects.

5.3.2.1 "Project One" ("PROJECT ONE")

The following are the key features of "PROJECT ONE". More detailed information can be found in chapter six.

- Single Multi-Party Contract (IFOA)
- Construction cost: $385 Million
- Gross SF: 720,000 SF
- Spring 2013 to be completed

5.3.2.2 "PROJECT TWO"

The following are the key features of "PROJECT TWO". More detailed information can be found in chapter seven.

- Multiple two-party contracts + A joining IPD agreement
- Construction cost $205 million
- Gross SF: 560,000 SF
- September 2011 completed

5.3.3 Project Delivery and Contracting Strategies (PDCS)

The PDCS framework, developed thru the literature (Figure 5-1), was used to extract the relevant information from the contract and to present the PDCS implemented in the project. Furthermore, a series of questions were developed to fill in the gaps through interviews.

5.3.4 Applied IPD Features

The IPD behavioral principles (Table 3-1) and the IPD variable characteristics (Table 5-2) were used as a baseline to develop a series of interview questions examining the applied IPD features.

5.3.5 Comparative Analysis of IPD and Traditional Delivery Approach

The interview questionnaire includes several open-ended questions thru which participants are asked to reflect on their experience in the current IPD project, and make a comparison with their experience on the past comparable traditional delivery projects. There were specific questions on how their roles and responsibilities, risk exposure, and liabilities have changed in the IPD project.

5.3.6 Trust Development Process

The questionnaire also includes a series of open-ended questions on trust development process. The participants were asked to first define trust, and then describe the factors influential on establishing trust, promoting trust, and promoting participants' sense of belonging to the project (which is a trust-building attribute). The whole interviews were recorded, and transcribed. The interview transcriptions were then analyzed, coded, key themes/titles were emerged based on the content, and the contents were categorized under different themes/titles. In the end, four charts were developed; the charts include the key themes/titles under each subject.: 1. First chart presents the factors influential on establishing trust, 2. The second chart exhibits the factors influential on promoting trust to a next level, 3. The third chart outlines the influential factors promoting participants'' sense of belonging to the project, and 4. The fourth chart is the combinatorial results of the three former charts and presents the influential factors leading to trust-based relationships.

5.3.7 Assessment of Trust

Trust is measured thru both direct questions asked from project participants, and also indirect questions. The indirect questions assess the perceived level of trust-building attributes in the project. A series of multiple choice questions were developed based on the trust-building attributes framework (Table 5-1). From the scale of 1 (minimum level) to 5 (maximum level), the key IPD participants were asked to assess the perceived level of trust-building attributes in the project. For each trust-building attribute the mean is calculated, and a bar chart is developed accordingly.

5.3.8 **IPD Approach and Trust-based Relationships**

Finally the participants were asked to reflect on the correlation of IPD approach and trust-based relationships. As stated earlier, the interviews were recorded, and transcribed. The content was analyzed, coded, the key themes/titles were merged, and the content was categorized under key themes/titles.

Furthermore, the questionnaire includes a series of multiple choice questions which examine the relative effectiveness of IPD versus a traditional delivery approach on trust-building attributes. There are three choices: 1. Less effective, 2. Same, 3. More effective. For the demonstration purpose, an assumption is made to give the effectiveness level of a traditional delivery approach on trust-building attributes, the level of three. Less effective influence is illustrated in the level of one, and more effective influence is illustrated in the level of five. The mean of participants' responses were calculated, and a bar chart developed correspondingly to schematically demonstrate the relative effectiveness of the IPD approach versus a a traditional delivery approach on trust-building attributes.

5.4 **Conclusion**

Following the case study developments, conclusion is made based on all the information gathered throughout the research. The conclusion includes the following information:

1) Definition of IPD, its traits and characteristics

In addition to the textual information and tables, the PDCS framework is utilized to exhibit the selection factors, macro and micro elements of IPD. The information is derived from the results of literature, and the two case studies.

2) Comparative analysis of IPD and a traditional delivery approach

Comparative analysis of IPD and a traditional delivery is presented in three ways: 1. A chart exhibiting the comparative results of IPD and a traditional delivery approach from the standpoint of "behavioral approach", "contracting approach", and "technological approach"; 2. The PCDS Framework side by side comparison of IPD and a traditional delivery approach; and 3. The framework presenting the comparative results of IPD versus a traditional delivery approach from the viewpoints of IPD participants in these two case studies.

3) Trust-based relationship: establishment and development

Lastly, two concluding frameworks on factors facilitating establishment of trust and factors promoting trust is developed. These frameworks are the combinatorial results of the literature-based framework and the frameworks developed through open-ended interviews with IPD participants in each project. Thus, the initial literature-based trust-building framework is further enhanced. The elements of the initial framework which were also pointed out in the interviews are highlighted. The additional elements are check marked.

4) Trust and IPD correlation

The final version of trust-building framework is utilized as a basis to demonstrate if/how each trust-building attributes correspond with IPD principles. The side by side comparison of trust-building attributes, the trust type, IPD principles, and the type, formed a basis for the final conclusion.

Furthermore, the mean of the all respondents' ratings on the effectiveness of IPD on each trust-building attribute in the two case studies are calculated; and a bar chart demonstrating the comparative effectiveness of IPD versus a traditional delivery approach is illustrated.

5.5 **Limitation**

The outcome of this research is based on the analysis of the information gathered through a literature review and the two IPD projects. Future research on various IPD projects will further test the findings of this research and provide a higher degree of confidence for generalizing the outcome.

CHAPTER 6 CASE STUDY ONE

The following case study is an analysis result of the information gathered through the IFOA agreement between Owner, Architect, Engineer, and CM/GC, and also individual one-on-one interviews with the IPD core group members including representatives of Owner, Owner's Project Manager, Architect, and CM/GC.

The overwriting objectives of developing the "PROJECT ONE" case study are: 1. To provide a real world example of an IPD project as a learning toolkit on the subject of Integrated Project Delivery (IPD) concept and the associated new terminologies; 2. To highlight the comparison results of IPD and a traditional delivery approach through "PROJECT ONE" example; 3. To demonstrate how a trust-based relationship is built and promoted throughout a project, and 4. To identify the correlation of IPD contracting strategies and trust-based relationships and to examine the comparative effectiveness of IPD versus a a traditional delivery approach on trust.

Based on the literature review and the IFOA agreement, a questionnaire was developed including both open ended and multiple choice questions. Interviews were conducted by the researcher at the "PROJECT ONE" construction site. The interviews were audio recorded, transcribed, analyzed, compared, combined, coded, and categorized under the emerging themes and titles.

The information on the "PROJECT ONE" case study is organized into eight sections: 1. Introduction to the "PROJECT ONE"; 2. Macro elements of the "PROJECT ONE" project delivery and contracting strategies (PDCS); 3. Micro elements of the "PROJECT ONE" PDCS; 4. IPD principles employed; 5. Comparative analysis of IPD and a traditional delivery approaches. 6. Trust-development process; 7. Assessment of trust in the project; and 8. Correlation of IPD approach and trust-based relationships.

- *Introduction to the "PROJECT ONE" project*

The information regarding project scope, schedule, and cost is taken from the IFOA agreement.

- *The project delivery and contracting approach including the IPD features*

The project delivery and contracting strategy (PDCS) framework (Figure 2-2), which was developed through literature review analysis, is used as a framework for presenting the case study information on the project delivery contracting approach implemented in the "PROJECT ONE" project. The IFOA

agreement and the results of the interviews are used to fill in the PDCS framework with the information on the case.

The IPD principles and characteristics framework (Table 3-1), which was developed through literature review and analysis, is utilized to identify the IPD features of the "PROJECT ONE" project.

- *Comparative analysis of IPD and a traditional delivery approach*

Through an open-ended questionnaire, the key IPD players were asked to reflect on their experience with the IPD approach; and to discuss how IPD has changed the way they used to carry out a similar project in a a traditional delivery setting; and how their responsibilities, liabilities, and risk exposures have changed in the IPD projects. This section presents the combinatorial result of the interviews with the core IPD team members.

- *Trust-development process*

The information in this section is the combinatorial results of the interviews with the core IPD team members. Through a series of open-ended questions participants are asked to define trust, discuss the parameters that are effective in establishing trust, promoting trust, and advancing participants' sense of belonging to the project. In the end, a table is developed that includes all the influential factors that result in building trust-based relationships. Based on the nature of the influential factors conclusions are made to demonstrate if/how a contract or project participants are effective factors in establishing and building trust.

- *Trust assessment*

The core IPD team members were asked to discuss their perceived level of trust towards each other at the onset of the project and how that initial level of trust has changed throughout the project. Furthermore, the trust-building attributes framework (

Table 4-1), which was developed through the literature review and analysis, is used to assess and measure trust in the project. The participants are asked to evaluate the trust-building attributes from the scale of 1 (indicating the minimum level of trust) to 5 (indicating the highest level of trust). For each trust-building attribute, the mean number of the participants' responses is calculated and a bar chart representing all trust-building attributes is developed accordingly to illustrate the level of trust in the project.

- *Correlation of IPD approach and trust-based relationships*

This section demonstrates how trust-based relationships and IPD contract correlates. Through an open ended question individuals were asked to discuss the interrelationships of the two. Furthermore, they were asked to comparatively assess the level of effectiveness of the IPD approach versus a a traditional delivery approach on trust-building attributes.

6.1 Introduction to "PROJECT ONE"

This section includes key factual information about the "PROJECT ONE": 1. Scope summary, 2. Master program budget, 3. Project schedule, and 4. Value definition. Table 6-1 exhibits a summary of the project information.

Table 6-1: "PROJECT ONE" information

"PROJECT ONE"	
Project Name	""PROJECT ONE" New hospital campus
Project Location	East South Central of the USA
Building Type	New 447-bed hospital on a green-field site, steel frame, seismic class D design, site access roads, and parking
Gross SF	720,000 SF
Owner	Owner
Project Time Frame	Spring 2009- Spring 2013
Form of Agreement	Integrated form of agreement utilizing "lean construction" approaches (single multi-party contract signed by Owner, Architect, Engineer, and CM/GC)
IPD Players	• Owner • Architect • Engineer • CM/GC • Project Manager
Key Dates:	Design: August 2009- February 2010 Construction: March 2009- April 2013
Cost	Master program budget: $385,000,000 Construction budget: $275,925,771

6.1.1 Scope Summary

"PROJECT ONE" a new 447 bed hospital at an approximately 165 acre site. Based on the scope of the project demonstrated in the contract, approximately 65 acres of the site is being developed in association with the construction of the hospital, including site access roads, parking, and the approximately 720,000

square foot hospital program. Approximately 20 additional acres is developed for storm water retention and flood plain mitigation.

6.1.2 Master Program Budget

According to the "PROJECT ONE" Implementation Manual, the contracted master program budget for the new replacement facility for "Project One" is $385,000,000. The master program budget is maintained by the Project Manager and its details are communicated appropriately amongst the Project Team Members. The value of construction is $275,925,771.

6.1.3 Project Schedule

The milestone schedule below (**Figure 6-1)** is developed per contract. This high level schedule is meant to serve as a summary of the major components of the overall project schedule, a basis for more detailed master program schedule, as well as pull scheduling.

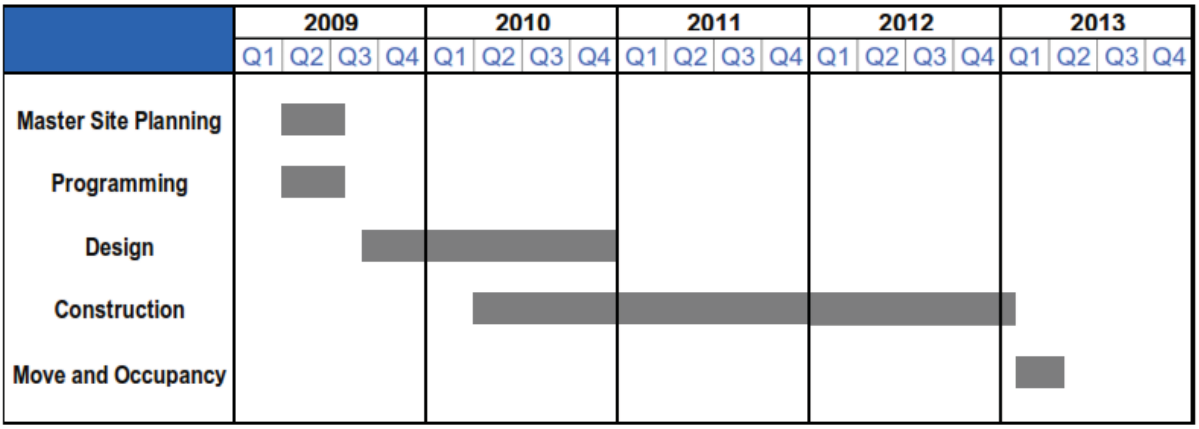

Figure 6-1: "PROJECT ONE" milestone schedule

6.1.4 Value Definition

The Owner's basic value proposition is to build the facilities for no more than the price set forth in the Construction Budget, within the time frame established by the Conceptual Schedule. In addition, the Owner believes that attaining that value proposition will be benefited by implementing Lean Project Delivery, promoting project efforts to pursue the following objectives: increasing the relatedness of members of the IPD Team; collaborating throughout design and construction with all members of the IPD Team; planning and managing the Project as a network of commitments; optimizing the Project as a

whole, rather than any particular piece; and tightly coupling learning with action (promoting continuous improvement throughout the life of the Project) (The "PROJECT ONE" Integrated Form of Agreement).

The Owner believes that by forming the IPD Team and implementing Lean Project Delivery, it will be able to eliminate wasted cost and time from the design and construction process, increase the quality of the final project, make the project safer, all while increasing the return on investment for IPD Team Members.

6.2 Macro Elements of Project Delivery and Contracting Strategy (PDCS)

The project delivery and contracting strategy framework, which was developed through literature review analysis, is used as a framework for presenting the project delivery contracting approach implemented in the "PROJECT ONE". Figure 6-2 illustrates the Macro elements of PDCS in "PROJECT ONE".

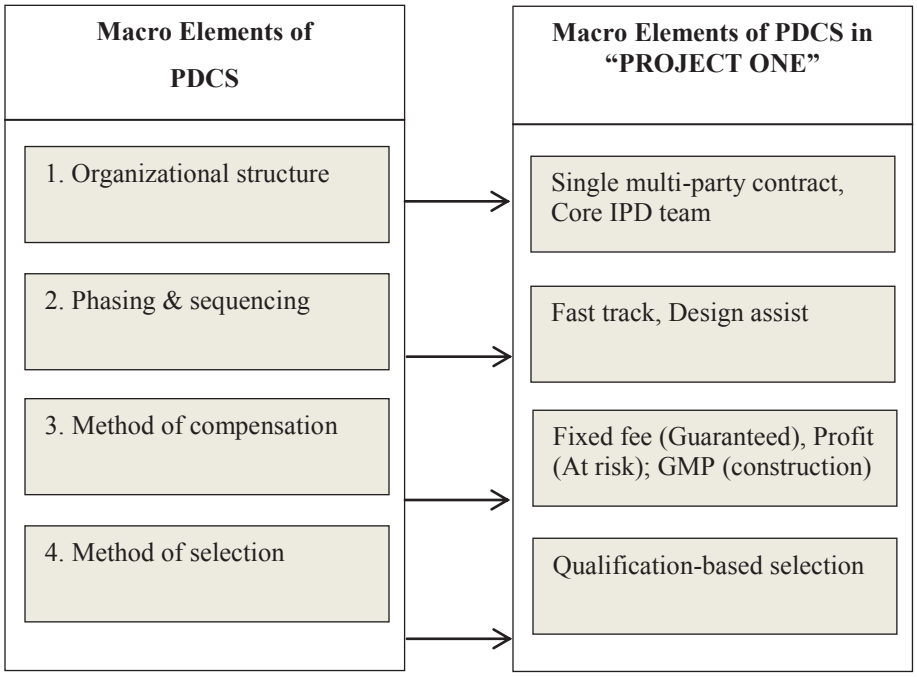

Figure 6-2: Macro elements of PDCS in "PROJECT ONE"

6.2.1 Organizational structure: Single Multi-Party Contract

"Project One" has selected Integrated Project Delivery (IPD) as a collaborative means of harnessing team member talents early on in the programming and design phases. IPD allows for concurrent and multi-level implementation and process management.

> According to the "PROJECT ONE" implementation manual, "IPD affords "PROJECT ONE" the opportunity to benefit from a shared vision of project success by bringing the Project Delivery Team together in order to streamline the design and construction phases and strengthen communication. Efficiency goes up and waste goes down under a successful IPD process. In other words, true IPD is a collaborative capital project delivery method that shares risk and reward in an Integrated Form of Agreement (IFOA) to reduce the time and cost to bring the "PROJECT ONE" replacement hospital to market."

As the Owner, "Project One" resides at the top of the organizational chart. The Property and Facility Committee (PFC) is a board appointed committee charged with managing the entire planning, design, procurement and construction process. The PFC also manages the transition into the new facility – a critical aspect of both design and construction planning and implementation. The Facility Steering Committee (FSC) is primarily responsible for the stewardship of the Board of Directors' interests. Ongoing review of the project scope, schedule, and budget is also a function of the FSC. The Steering Committee provides overall project direction and major issue resolution. The Core Group located at the bottom of the organizational chart is a collection of key entities that drives programing issues from high level space definition to detailed design solutions. The project is governed by the Core Group. All entities involved in the project are under the guidance and direction of the Core Group (IFOA Agreement).

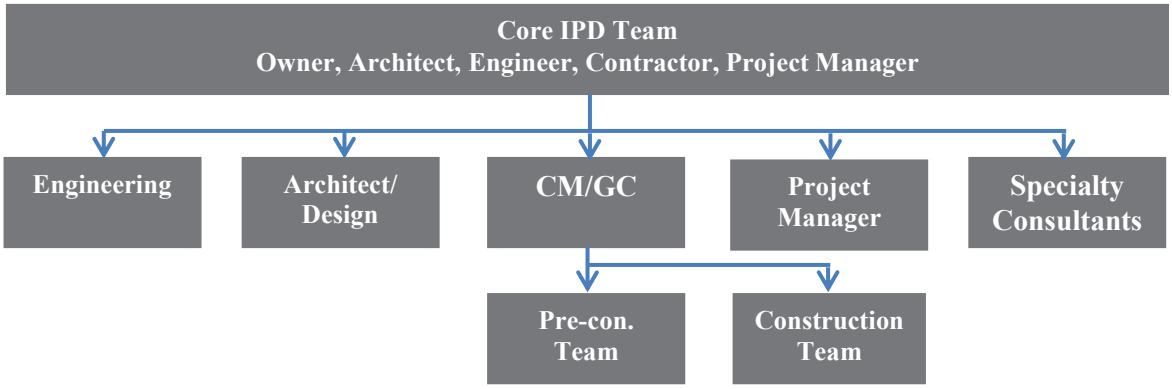

Figure 6-3: Core team organizational structure in "PROJECT ONE"

The initial Core Group includes members representing the Owner, the Engineer, the Architect, the CM/GC, and the Owner's Representative (PM). The Core Group is facilitated by the Owner's Representative (PM).

According to the IFOA, "the initial Core Team may invite others to become members of the Core Team and may also request added members to leave the Core Group. In forming an IPD Team, the parties expect that major Trade Contractors will be selected to provide pre-construction services early in the pre-construction phase and will sign Joining Agreements as they become members of the IPD Team. Architect's Consultants, Engineer's Consultants, and Owner's Consultants are also expected to sign Joining Agreements as well."

As outlined in the IFOA agreement, by forming an IPD Team, the parties intend to gain the benefit of an open and creative learning environment, where team members are encouraged to share ideas freely in an atmosphere of mutual respect and tolerance.

In the interviews conducted with the CM/GC, they indicated that they included the intent of the Integrated Project Delivery team as a supplement to the subcontractors' contracts. Thus, the subcontractors know that in addition to their traditional roles and responsibilities they are expected to be proactive in the process and act as an integrated team. The subcontractors were not part of the IPD joining agreement. And thus, the subcontractors do not participate in the IPD core team meetings.

6.2.2 **Phasing & Sequencing: Fast Track and Design Assist**

The "PROJECT ONE" is a fast track project, meaning that some portions of construction preceded the completion of the design phase (Figure 6-1). The Owner selected the Architect, CM/GC, and Engineer right at the beginning of the project. The Owner's rep (PM) was brought to the team a few months later.

The CM/GC team was brought to the project early in the pre-construction phase, to work with the architect/engineer and to perform design assist services. CM/GC team also contracted with the MEP subcontractor early in the preconstruction phase to provide design assist services.

> As stated in the contract document, "It is anticipated that CM/GC will contract with necessary Trade Contractors and Suppliers, as approved by the Core Group, to provide preconstruction services as described in the Contract Documents. It is anticipated that key trades will be retained during schematic design to facilitate an integrated, collaborative design process."

The subcontractors understand that if they spend more time upfront providing input to the team and assist in maintaining the project under budget and on time, they will save much more time and headache at the backend to make corrections and re-do the work (CM/GC).

The work is performed through following phases: Phase I: Pre-programming and Planning, Phase II: Patient Experience, Phase III: Site Master Planning, Phase IV: Conceptual Design, Phase V: Schematic Design, Phase VI: Design Development, Phase VII: Construction Documents Phase, Phase VIII: Permitting/Pricing, Phase IX: Construction, Phase X: Project Close-Out (IFOA).

6.2.3 **Method of Compensation**

At the "PROJECT ONE" case the Contractor's, Architect's, and Engineer's compensation is guaranteed; however, if there is an issue in the project and all the insurance is exhausted, some of their fee may become at risk. There is a limitation on liability for their at risk fee.

- *Architect's compensation: Fixed fee percentage of the construction cost*

During project initiation phase, the Architect was hired on fixed fees and was paid hourly for their non-basic services. Non-basic services usually include strategic programming, operations design, and master planning. The agreement for non-basic services was a fixed fee letter. All parties agree that billings for Phases 1 through 4 shall not exceed $818,484 (IFOA). The fixed fee is guaranteed and covers both design cost and architect profit. The Architect has to manage their time effectively in such a way that their fee covers their design cost, and provides them with a reasonable profit (Architect).

The Architect has a contract for a fixed fee percentage based on the construction cost for Phases V through IX, which is established upon acceptance of the GMP. The fixed fee percentage is established based on the Architect's estimation of profit goal and the amount of time needed to do the design (IFOA).

- *Engineer's compensation: Fixed fee percentage of engineers cost*

Owner pays Engineers a fixed fee of 2.15% of Engineers' Cost of the work which is established based upon the final value of the GMP (IFOA).

- *CM/GC's compensation: Fixed fee for pre-construction services, and GMP for construction*

CM/GC was compensated based on a fixed fee ($800,000) for pre-construction services. The fixed fee is established based on the CM/GC's assessment of the required work man hours to be assigned for the pre-con phase.

The GMP proposal is prepared by the CM/GC when the Core Group determines that the Drawings and Specifications are sufficiently complete which shall be no later than completion of 90% Construction Documents. The GMP is the sum of the estimated Cost of the Work, the IPD Team Performance Contingency and CM/GC's Fee. The CM/GC's fee rate is 2.3% of the cost of the work. The GMP including the CM/GC's fee is treated as a lump-sum and will not be reduced if the cost of the work decreases without a change in the scope of the work. Costs and expenses which would cause the GMP to

be exceeded shall be paid by CM/GC without reimbursement by Owner when such a cost over-run does not fall into change order, or applicable to IPD team performance contingency (IFOA, p.69).

Thus, there is a portion of the General Contractor's fee at risk. However, there is a limitation on liability in terms of total at risk fee. Additionally, there is a portion at risk associated with the professional liability insurance. CM/GC is responsible for deductible portion of the professional liability insurance which includes up to $600,000 that collectively would come out of the CM/GC's fees (CM/GC).

> "The Construction Budget includes:
>
> (a.) Total cost to Owner of all elements of site development and construction designed or specified by all responsible designers including the total costs of labor and materials to be furnished by CM/GC including Design-Build Work;
>
> (b.) IPD Team Performance Contingency and Allowances, in the amount of 10% of the estimated Cost of the Work, less CM/GC's general conditions and fee in amounts carried in the Target Cost Model/GMP;
>
> (c.) CM/GC's Fee;
>
> (d.) Amounts to cover bidding and price escalations; and
>
> (e) Insurance Costs (The Contractor shall include costs of all insurance in the construction budget excluding Builder's Risk and Professional Liability. Upon enrollment in the Owner
>
> Controlled Insurance Program, the Contractor will review costs included in the construction budget and determine credits that are applicable to the Owner. Costs for the OCIP policy shall be carried by the Owner" (IFOA).

- *Project Manager's compensation*

PROJECT MANAGER's compensation is guaranteed as long as they perform. Even though project manager usually has a long term contract with an Owner, the contract can be cancelled by the owner any time with 30-days notice. PROJECT MANAGER as the owner's rep is not included in the incentive plan, so that they could act clearly and objectively (PM).

6.2.4 **Method of Selection**

The Owner selected the Architect, CM/GC, and Engineer at the beginning of the project. The Owner's rep (PM) was brought to the team a few months later. Table 6-2 illustrates the team selection criteria.

Table 6-2: Selection criteria for the IPD Core Team in "PROJECT ONE"

Selection criteria	Architect	CM/GC	Owner's rep. (PM)
Qualification based on experience, familiarity with the work, knowledge, competency, etc.	x	x	x
Price			x
Design	x		
Innovative approach to planning	x		
Familiarity with IPD (collaborative) agreement		x	

- *Trade Selection*

  "CM/GC shall seek to develop Trade Contractor interest in the Project and shall collaborate with the Core Group to develop a list of possible Trade Contractors, including suppliers who are to furnish materials or equipment fabricated to a special design, from whom proposals will be requested for each principal portion of the Work. Before proposing any Trade Contractor or Supplier, CM/GC shall satisfy itself that the proposed firm has the financial resources, qualifications, and experience to complete the work for which it is proposed and is available to do so. The Core Group will promptly review the qualifications and decide whether to add the proposed firm to the list. The 'pre-qualification' of proposed firms shall not waive the right of the Core Group later to object to or reject any proposed Subcontractor or Supplier" (IFOA, p.13).

  As stated in the IFOA, "It is anticipated that CM/GC will contract with necessary Trade Contractors and Suppliers, as approved by the Core Group, to provide preconstruction services as described in the Contract Documents. It is anticipated that key trades will be retained during schematic design to facilitate an integrated, collaborative design process. For these key trades, Owner anticipates that proposals will be solicited on a Request for Proposal basis and that selections will be made in collaboration with the Core Group.

If CM/GC intends to perform a particular scope of Work using its own forces, CM/GC shall provide the Core Group with its qualifications to perform the Work."

Finally, the subcontractors were selected on a competitive fashion based on their submitted proposals and qualifications. The subcontractors submitted their budget estimations (GMP) based on a schematic document. CM/GC's decision, however, for selecting the subcontractors was much less based on a number and more on their qualifications as a team (CM/GC).

- *Consultant selection*

  "Consultant selection shall proceed on a Request for Proposal basis by Architect or Engineer. Final selection shall be made by the Core Group" (IFOA, p.14).

6.3 Micro Elements of Project Delivery Contracting Strategies (PDCS)

Figure 6-4 illustrates the micro elements of PDCS in "PROJECT ONE". The following sections provide additional information on each element.

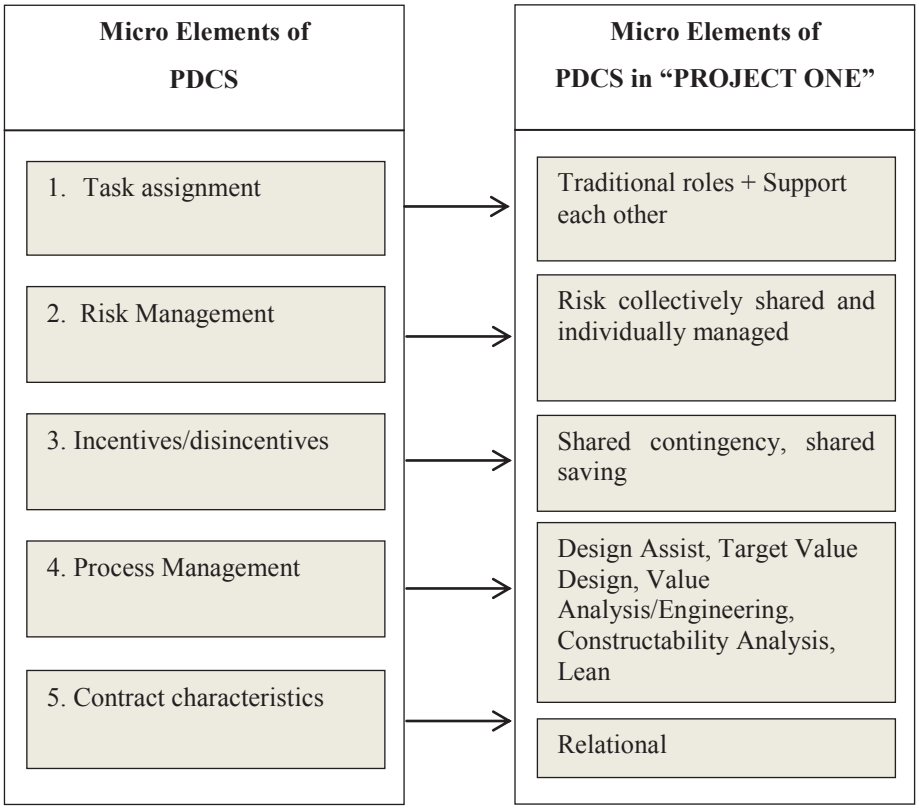

Figure 6-4: Micro elements of PDCS in "PROJECT ONE"

6.3.1 Task Assignment

This section provides information on tasks assigned to the Owner, Architect, CM/GC, Core IPD Team, and the Senior Executive Team. The information is the combinatorial result of data collected through the IFOA and the individual interviews with the IPD team members. For each of the above entities a table is developed that illustrates the key tasks assigned to each party.

6.3.1.1 Owner's Roles and Responsibilities

Table 6-3 demonstrates the key roles and responsibilities of the owner in "PROJECT ONE". Following sections provide further descriptions.

Table 6-3: Owner's roles and responsibilities in "PROJECT ONE"

Participants	Tasks
Owner	Defining scope and development of a program
	Payments

"Owner shall provide full information and cooperation to assist in development of a Program which shall set forth Owner's design objectives, constraints and criteria, including space requirements and relationships, flexibility and expandability, special equipment and systems and site requirements. Architect and Engineer shall assist Owner in identifying and determining the necessary information and requirements which shall be subject to Owner approval" (IFOA, p.25).

- *Payment*

"Final Payment shall be made by Owner to Architect, Engineer and CM/GC in accordance with this section within forty-five (45) days after the Core Group's receipt of all close-out documentation and final certification of the Cost of the Work" (IFOA, p.83).

6.3.1.2 Architect's Roles and Responsibilities

Table 6-4 demonstrates the Architect's key roles and responsibilities in "PROJECT ONE". Further description on each task is provided below.

Table 6-4: Architect's roles and responsibilities in "PROJECT ONE"

Participants	Tasks
Architect	Preparing Coordinated Design Documents
	Construction Administration
	Site Visits
	Review of Submittals

- *Preparing Coordinated Design Documents*

"Architect and Engineer shall be responsible for coordinating the information provided by each other, the Owner, Owner's Consultants, CM/GC, Subcontractors and Suppliers, Architect's Consultants and Engineer's consultants to prepare coordinated Design Documents pursuant to this Agreement" (IFOA, p.18).

- *Construction Administration*

  "Architect and Engineer will provide Construction Administration until Final Payment is due. Architect and Engineer will have authority to act on behalf of Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Agreement" (IFOA, p.42).

- *Site Visits*

  "Architect and Engineer will visit the site at intervals appropriate to the stage of construction to become familiar with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. However, neither Architect or Engineer will be required to make exhaustive or continuous on-site inspections to check quality or quantity of the Work. On the basis of such on-site observations as a design professional, Architect and Engineer shall prepare site observation reports concerning the progress and quality of the Work, and promptly alert the Core Group to any non-conformance or condition, that was observed which might, in their professional opinions, adversely affect the Work or Owner's budget. Architect and Engineer shall submit a written report to the Core Group within five (5) days after each site visit" (IFOA, p.42).

- *Review of Submittals*

  "Architect, Architect's Consultants, Engineer and/or Engineer's Consultants will review and approve or take other appropriate action upon CM/GC's Submittals for the purpose of checking for compliance with the information given and the design concept expressed in the Contract Documents… Architect's and Engineer's review of CM/GC's Submittals shall not relieve CM/GC of its obligations under the Contract Documents" (IFOA, p.44).

- *Not responsible for means and methods*

  "Neither Architect nor Engineer will have control over or charge of, or be responsible for, the construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely CM/GC's and Subcontractor's rights and responsibilities under the Contract Documents, except as expressly provided elsewhere. Neither Architect nor Engineer will be responsible for CM/GC's failure to perform the Work in accordance with the requirements of the Agreement.

Neither Architect nor Engineer will have control over or charge of, or be responsible for, acts or omissions of CM/GC, Subcontractors, or their agents or employees, or of any other persons performing portions of the Work. Notwithstanding the foregoing, if Architect or Engineer observes any defects, deficiencies or non-conformities in the Work, they shall immediately notify both CM/GC and Owner in writing" (IFOA,p.42).

6.3.1.3 CM/GC's Roles and Responsibilities

CM/GC's responsibilities include but are not limited to delivering a non-defective, conforming work, completing the work within the GMP and contract time, sufficient documentations, making payments to subcontractors, and suppliers (IFOA, pp.77-8).

Table 6-5 lists the CM/GC's tasks in "PROJECT ONE".

Table 6-5: CM/GC's roles and responsibilities in "PROJECT ONE"

Participants	Tasks
CM/GC	Constructability review
	Verifying field condition and measurement
	GMP proposals
	Preparing site documents
	Securing and paying for permits and fees
	Responsible for means and methods, supervision and oversight
	Safety
	Managing hazardous materials
	Coordinating inspections
	Provide and pay for labor and material
	Timely completion of the work

- *Constructability Review*

  "CM/GC and Trade Contractors shall continually review the Design Documents for clarity, consistency, constructability and coordination among the design disciplines' drawings and the construction trades and collaborate with the IPD Team in developing solutions to any identified issues. Unless otherwise directed by the Core Group, CM/GC shall conduct two formal, documented Constructability Reviews: when the Construction Documents are fifty percent (50%)

complete and when the Construction Documents are ninety percent (90%) complete" (IFOA, p.28).

"The results of the review shall be provided in writing and as notations on the Construction Documents. Architect, Architect's Consultants, Engineer and Engineer's Consultants shall review and respond in writing to each comment in the Constructability Review, either by incorporating changes in the Design Documents or explaining why such action is unnecessary" (IFOA, p.29).

- *Verifying Field Condition and Measurement*

  "To allow Architect or Engineer to make corrections, CM/GC and Subcontractors shall, sufficiently in advance of undertaking Work, take field measurements and verify field conditions and carefully compare such field measurements and conditions and other information known to CM/GC or Subcontractors with the Contract Documents. Errors, inconsistencies or omissions discovered shall be reported immediately to Architect, Engineer and Owner in writing" (IFOA, p.39).

- *Guaranteed Maximum Price (GMP) Proposal*

  "When the Core Group determines that the Drawings and Specifications are sufficiently complete (which shall be no later than upon completion of 90% Construction Documents), CM/GC shall prepare a Guaranteed Maximum Price ("GMP") proposal, which shall be the sum of the estimated Cost of the Work, the IPD Team Performance Contingency and CM/GC's Fee, and which shall be subject to agreed upon assumptions and Qualifications which are approved by the Core Group" (IFOA, p.29).

- *Preparing Site Documents*

  "CM/GC shall prepare and maintain on a current basis an accurate and complete set Record Drawings and Annotated Specifications. These Record Drawings and Annotated Specifications shall be kept at the Project site, and CM/GC shall update them as often as necessary to keep them current, but no less often than every two (2) weeks. The Record Drawings and Annotated Specifications shall be available for inspection by IPD Team Members, and any governmental or quasi-governmental authority with jurisdiction over the Work" (IFOA, p.46).

- *Securing and Paying for Permits and Fees*

"Unless otherwise provided in the Contract Documents, CM/GC shall secure and pay for the building permits and other permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Agreement and which are legally required" (IFOA, p.41).

- *Responsible for Means and Methods, Supervision and Oversight*

"CM/GC shall supervise and direct the Work using CM/GC 's best skill and attention. CM/GC shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures, including safety procedures, and for coordinating all portions of the Work, unless the Contract Documents give other specific instructions.

CM/GC shall be responsible to Owner for acts and omissions of CM/GC 's employees, Subcontractors, Suppliers, and any of their agents and employees, and other persons or entities performing portions of the Work for or on behalf of CM/GC or any of its Subcontractors, Suppliers" (IFOA, p.39).

- *Safety*

"CM/GC shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with performance of the Work. CM/GC shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to:

  - ✓ Employees on the Work site and other persons who may be affected by the Work;
  - ✓ The Work and materials and equipment to be incorporated;
  - ✓ Other property at or adjacent to the site;
  - ✓ Plant life and soils, without limitation, due to solvents, oils and any other substance which may be harmful" (IFOA, P.47).

- *Managing Hazardous Materials*

"CM/GC shall not cause or permit any Hazardous materials to be generated, released, disposed, discharged, or brought onto or stored at the Project site or used in the construction of the Work, except for specified materials and commonly used construction materials for which there is no reasonable substitute" (IFOA, P.51).

- *Coordinating Inspections*

  "If any of the Work is required to be inspected or approved by any public authority, CM/GC shall cause such inspection to be performed or approval to be obtained. No inspection performed or failed to be performed by Owner shall be a waiver of any of CM/GC's obligations or be construed as an approval or acceptance, in whole or in part, of the Work" (IFOA, p.39).

- *Provide and Pay for Labor, Material, and Equipment*

  "Unless otherwise provided in the Contract Documents, CM/GC shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work" (IFOA, p.40).

- *Timely Completion of the Work*

  "Whenever it becomes apparent that the Substantial or Final Completion dates may extend beyond the time specified herein, CM/GC shall initiate collaborative efforts to re-plan the Work in order to achieve Substantial and Final Completion within the Contract Time" (IFOA, pp.53-4).

  "CM/GC shall identify in the Construction Milestone Schedule when such licenses, permits, fees and inspections shall be necessary" (IFOA, p.41).

6.3.1.4 Core IPD Team Roles and Responsibilities

Table 6-6 demonstrates the key roles and responsibilities of the core IPD team at the "PROJECT ONE". Further description on each task is provided below.

Table 6-6: Core IPD Team's roles and responsibilities in "PROJECT ONE"

Participants	Tasks	
Core IPD Team	Participation in the selections of key trades and consultants	
	Joint site investigation	
	Reviewing and evaluating project progress	Reviewing and stimulating the progress of the Project
		Developing and pursuing the Project Evaluation Criteria and improving project performance and performers satisfaction
	Developing protocols	Establishing communication protocols for the Project
		Establishing protocols and procedures to inform design by the cost and schedule implication of design

		Developing written guidelines or protocols for use of Target Value Design principles
	Overseeing development of the design document	
	Overseeing schedule	Reviewing and approving Make-Ready Look Ahead Plan and Milestone Schedule
		Approval of pull-based design production
		Reviewing excusable delay and granting time extension
		Reviewing differing site condition and making adjustment to CM/GC contract time and sum
	Construction budget management	Reviewing and approving change in construction budget
		Aligning construction budget and evolving cost model
		Management of IPD team performance contingency
		Developing and adopting incentive program
		Review of GMP proposal
	General management	Review and approval of 5s Plan
		Reviewing and approval of change orders
		Approval of progress payment
		Inspection and issuing a certificate of final completion
		Coordination between Owner's own force and separate contractors
		Specifying desired warranties
		Establishing the format and number of sets of design and specifications
		Dispute resolution

- *Participation in the selections of key trades and consultants*

The Core Group also shall participate in selections of key trades and suppliers.

> "CM/GC shall seek to develop Trade Contractor interest in the Project and shall collaborate with the Core Group to develop a list of possible Trade Contractors, including suppliers who are to furnish materials or equipment fabricated to a special design, from whom proposals will be requested for each principal portion of the Work. Before proposing any Trade Contractor or Supplier, CM/GC shall satisfy itself that the proposed firm has the financial resources, qualifications, and experience to complete the work for which it is proposed and is available to do so. The Core Group will promptly review the qualifications and decide whether to add the proposed firm to the list. The "pre-qualification" of proposed firms shall not waive the right of the Core Group later to object to or reject any proposed Subcontractor or Supplier" (IFOA, p.13).

"Consultant selection shall proceed on a Request for Proposal basis by Architect or Engineer. Final selection shall be made by the Core Group" (IFOA, p.14).

- *Joint Site Investigation*

  "The Core Group shall develop a Joint Site Investigation Plan for developing the scope of pre-construction investigations at or concerning the site. During the Pre-construction Phase (prior to finalizing the Target Cost Model), the parties shall advise the Core Group in writing of all information which is needed from others to design the Project. The Core Group will review any existing information and assess to what extent additional investigations should be pursued and shall identify in writing any apparent deficiencies or discrepancies in the information Owner provides during each phase" (IFOA, pp.15-16).

- *Developing and pursuing the Project Evaluation Criteria and improving project performance and performers satisfaction*

  "The Core Group shall be responsible for reviewing and stimulating the progress of the Project and developing and pursuing the Project Evaluation Criteria. The Core Group shall also review the periodic project evaluations and shall plan and implement programs to improve Project performance and performer satisfaction on the Project.

  The Core Group meetings shall be held separately from other meetings for the purpose of ensuring their importance and the candor of the exchange at the Core Group meeting" (IFOA, p.7).

- *Establishing communication protocols for the project*

  "The Core Group shall establish communication protocols for the Project. If the protocols permit direct communications with the Subcontractors, Architect's Consultants and Engineer's Consultants (rather than such communications flowing through the Architect and CM/GC), copies shall be provided to Core Group members. The protocol shall allow the use of e-mail for written communications, establishment of web-based project management systems, production and publication of meeting minutes and email addresses, and other issues relating to project communication" (IFOA, p.8).

- *Establishing protocols and procedures to inform design by the cost and schedule implication of design*

"The Core Group shall also establish protocols and procedures so that design proceeds fully informed by the cost and schedule implications of the design" (IFOA, p.10).

- *Developing written guidelines or protocols for use of Target Value Design principles*

  "The Core Group shall develop written guidelines or protocols for use of Target Value Design principles throughout the design process" (IFOA, p.20).

- *Overseeing development of the design document*

  "The Core Group shall oversee development of the design documents for the Project" (IFOA, p.25). "The design team must avoid "advancing" aspects of the design beyond what has been anticipated and approved for any given time period by way of the Core Group's approved planning process" (IFOA, p.26).

- *Reviewing and approving Make-Ready Look Ahead Plan and Milestone Schedule*

  The Core Group shall review and approve Make-Ready Look Ahead Plan and Milestone Schedule (IFOA, pp11-12).

- *Reviewing excusable delay and granting time extension*

  "If a delay occurs that would otherwise be an Excusable Delay but for the existence of schedule float when the delay occurs, the Core Group shall re-assess whether to grant a time extension based upon the cause of other delays which ultimately contribute to any delay in Project completion beyond the Contract Time" (IFOA, p. 54).

- *Reviewing differing site condition and making adjustment to CM/GC contract time and sum*

  "The Core Group shall promptly investigate reported differing site conditions and, if they differ materially and cause an increase or decrease in CM/GC's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum/GMP or Contract Time, or both" (IFOA, p.57).

- *Reviewing and approving change in construction budget*

  "The Construction Budget cannot be revised without resubmitting the Project to that Core Group for approval, which approval could be withheld. This process would result in significant delays

for the Project. Therefore, the IPD Team shall use its best efforts in accordance with the applicable standard of care to design the Project so that it may be constructed without exceeding the Construction Budget. The Owner agrees to use its best efforts to make decisions relating to the Project that are within the Construction Budget" (IFOA, p,20).

- *Aligning construction budget and evolving cost model*

  "If the anticipated project costs as shown in the Project Cost Model fail to align with the Target Costs or the overall Construction Budget, the Core Group shall determine what actions to take in order to align the Construction Budget and the current cost model. If any party contends that its efforts to bring the design and Construction Budget into alignment will result in additional costs for which it believes that it is entitled to additional compensation, the Core Group shall determine the validity of that request and may afford that party access to the IPD Team Performance Contingency to cover the cost" (IFOA, pp.23-24).

- *Management of IPD team performance contingency*

  "Neither CM/GC, Architect or Engineer shall be entitled to draw against the contingency without the Core Group's prior written approval, which consent shall not be unreasonably withheld. Unused IPD Team Performance Contingency shall be distributed in accordance with an incentive program to be adopted by the Core Group" (IFOA, p.30).

  "The Core Group shall meet at least monthly, beginning with commencement of construction to assign Change Orders or requests to access the IPD Team Performance Contingency" (IFOA, pp.36-37).

- *Developing and adopting incentive program*

  "In support of Lean Project Delivery, the Core Group, including the Senior Management Representatives, shall develop a financial incentive program as they deem appropriate to encourage successfully achieving superior performance and exceeding the Project Evaluation Criteria" (IFOA, p.37).

- *Review of GMP proposal*

  "CM/GC shall meet with the Core Group to review the GMP Proposal and the written statement of its basis" (IFOA, p.32).

- *Review and approval of 5s Plan*

"The 5S Plan shall be submitted to the Core Group for review and approval" (IFOA, p.38).

"The Core Group will promptly review the Payment Application to confirm compliance with the amounts approved in the Pencil Draw and the terms of the Contract Documents" (IFOA, p.77).

"Upon receipt of written notice from CM/GC that the Work is ready for final inspection and acceptance, the Core Group will promptly make such inspection. Based upon such inspection and finding the Work acceptable under the Contract Documents and the Agreement fully performed, including all items noted at Substantial Completion, Owner, Architect and Engineer will promptly issue a Certificate of Final Completion accepting the Project as completed in accordance with the terms and conditions of the Contract Documents ("Final Completion")" (IFOA, p.82).

"The Core Group shall provide for coordination of the activities of Owner's own forces and of each separate contractor with the Work. Representatives of the IPD Team shall participate with other separate contractors and Owner in reviewing and coordinating their planning and schedules when requested to do so. The parties shall cooperate in developing coordinated planning documents" (IFOA, p.93).

"The Core Group shall advise CM/GC, prior to execution of GMP, of specific extended warranties which the Core Group desires to obtain for the Project and CM/GC shall cooperate with Core Group in obtaining the extended warranties" (IFOA, p.95).

"Unless otherwise provided in the Contract Documents, the Core Group shall establish the format and number of sets of Drawings and Specifications to be provided by Architect and Engineer under their reimbursable budget to CM/GC throughout pre-construction including the permitted set of Drawings and Specifications, including electronic format" (IFOA, p.97).

"In the event of uncertainty or disagreement concerning the meaning or interpretation of the Contract Documents, questions shall be referred to the Core Group" (IFOA, p.107).

6.3.1.5 **Senior Executive Team's roles and responsibilities**

Dispute resolution: If the Core Group is unable to resolve the Claim, any party may request a Senior Management Meeting with the Core Group. Upon such a request, a Senior Management Representative from CM/GC, Owner, Engineer and Architect each shall review the claim in detail and then meet face-to-face to discuss and resolve the matter" (IFOA, p.110).

Table 6-7: Project Executive Team's roles and responsibilities in "PROJECT ONE"

Participants	Tasks
Project Executive Team	Dispute resolution

6.3.2 **Risk Management**

Unlike the traditional delivery process, where the designer is solely responsible for design risks; in "PROJECT ONE", the CM/GC collectively with the designers assumes design-related risks. This type of risk sharing is typical to the IPD delivery approach. To eliminate the perception of the risk, the Owner in"PROJECT ONE" purchased a project specific professional liability policy for the project; that makes everyone more comfortable with the additional risk they are collectively sharing. Liability of parties is limited so the Owner would be exposed to damages above and beyond that. According to the core IPD team, like any other type of project delivery, the Owner is the party most at risk in this type of arrangement. Table 6-8 illustrates the risk assigned or shared by parties in "PROJECT ONE" case study.

Table 6-8: Risk assignment strategies in "PROJECT ONE"

Risk Sharing/Allocation	**Risk Category**	**Risks**	**Responsibility for Risk Management**		
			Owner	Architect	CM/GC
Risks shared among IPD Team (Owner, Architect, Contractor)	Design Errors	Risk of Design Errors	X	X	X
Risks allocated to Owner	Unknown Condition	Risk of Concealed or Unknown Condition	X		
	Delay	Risk of Excusable and Compensable Delay	X		
		Risk of Delay Due to Adverse Weather	X		
Risks allocated to Architect	Building Codes	Risk of Non-Compliancy with Building Codes and Regulation		X	
Risks allocated to CM/GC	Differing Conditions	Risk of Differing Site Condition (discovered or discoverable)			X
		Risk of Errors, Inconsistency, or Omission Related to Field Measurements in Contract Documents			X
	Regulation	Risk of Changing Rules and Regulations after GMP is Set			X
	Safety	Risk of Hazardous Materials			X
	Delay	Risk for Inexcusable Delay			X
	Property Damage	Responsibility for Damage Caused by CM/GC or their Subs			X
	Lien	Risk of lien after receiving payments			X

6.3.2.1 **Risks Shared among the IPD Team (Owner, Architect, Contractor)**

- *Risk of Design Errors/Omissions*

  "If, during construction of the Project, Owner incurs additional costs as a result of errors or omissions of IPD Team Members, excluding Owner and Owner's Consultants (whether violating the standard of care or not), in excess of the IPD Team Performance Contingency, (for CM/GC) and in excess of the Owner Contingency (for Architect and Engineer), and not covered and actually paid by insurance required by this Agreement, the party responsible for the error or omission shall pay (subject to the provisions of Section 13.6 below) all such Owner's extra costs, including all construction costs to the extent caused by such IPD Team Members' errors or omissions; provided, however, that for purposes of calculating additional construction costs, CM/GC, Architect and Engineer shall only be responsible as follows:

  - ✓ for delays caused by its errors or omissions, the actual costs paid or reasonably incurred by the Owner to the extent caused by the delay;

  - ✓ for its errors or omissions that cause additional costs that would not have been incurred had the error or omission been corrected prior to completion of the Design Documents, 100% of the actual costs paid or reasonably incurred by Owner to the extent caused by the error or omission;

  - ✓ for its errors or omissions that cause additional costs that, at least in part, would have been incurred had the error or omission been corrected prior to completion of the Design Documents but which are presumed to be more costly as a result of being added during the Construction Phase, the actual costs paid or reasonably incurred by Owner to the extent caused by the error or omission" (IFOA).

6.3.2.2 **Risks Allocated to Owner**

- *Risk of Concealed or Unknown Conditions*

  "If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents ("Differing Site Conditions"), then notice by the

observing party shall be given to the CM/GC promptly before conditions are disturbed and in no event later than ten (10) days after first observance of the conditions. The Core Group will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in CM/GC's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum/GMP or Contract Time, or both. If the Core Group determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Core Group will notify CM/GC in writing, stating the reasons. If after receiving the response, CM/GC still intends to pursue a Claim, it shall provide written notice within ten (10) days after it has received the decision. Conditions will not be qualified as concealed or unknown if they were readily visible or reasonably accessible in performance of the Joint Site Investigation" (IFOA, p.57).

- *Risk of Excusable and Compensable Delay*

  "If CM/GC is delayed at any time in the commencement or progress of the Work by an 'Excusable Delay' or 'Compensable Delay' as defined below and CM/GC complies with the requirements of this Article, the Contract Time shall be extended. If the delay is a Compensable Delay, CM/GC shall also be entitled to an adjustment in the Contract Sum/GMP for actual costs incurred as a result of the Compensable Delay" (IFOA, p.54).

  'Excusable Delay' means any delay in Final Completion of the Work beyond the expiration of the Contract Time caused by conditions beyond the control and without the fault or negligence of CM/GC which were not and could not in the exercise of reasonable diligence have been foreseen by CM/GC, such as strikes, embargoes, unavoidable casualties, fire, natural disasters, unusual delays in transportation of materials, or national emergency" (IFOA, p.54).

  'Compensable Delay' means any delay that impacts the critical path of the work or that forces Final Completion of the Work beyond the expiration of the Contract Time to the extent caused by the wrongful acts or omissions of Owner, or issuance of Change Orders or directions to suspend the Work not attributable to the fault or neglect of CM/GC or its Subcontractors or Suppliers and which delay is unreasonable under the circumstances involved and not within the contemplation of CM/GC, provided that CM/GC complies with the requirements of this Agreement. A Compensable Delay shall entitle CM/GC to an extension of the Contract Time and/or an adjustment of the Contract Sum/GMP provided it has complied with other provisions of the Contract Documents" (IFOA, p.55).

- *Risk of Delay Due to Adverse Weather*

  "If CM/GC is delayed at any time in progress of the Work by adverse weather, or the impact of weather conditions of the site, then the Contract Time shall be extended only for those delays which meet the tests that outlined in the contract document under section 22.15" (IFOA, p.56).

6.3.2.3 **Risks Allocated to Architect**

- *Risk of Non-Compliancy with Building Codes and Regulation*

  "It is not CM/GC's or Subcontractors' ultimate responsibility to ascertain that design documents prepared by Architect, Architect's Consultants, Engineer, or Engineer's Consultants are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations, ("Building Regulations") unless such Building Regulations bear upon construction means, methods, techniques and sequences" (IFOA, p.26).

  "CM/GC and Subcontractors shall not be liable to Owner, Architect or Engineer for damages resulting from variance in the design documents prepared by Architect, Architect's Consultants, Engineer or Engineer's Consultants with applicable Building Regulations unless CM/GC or Subcontractors observed, and failed to promptly report it to Architect, Engineer and Owner" (IFOA, p.26).

6.3.2.4 **Risks Allocated to CM/GC**

- *Risk of Differing Site Condition*

  "CM/GC represents that during the Pre-construction Phase and before submitting its GMP proposal, it will carefully examine the site at which the Work will be performed and all of the documents included in the Contract Documents; recommend to the Core Group or perform all reasonable investigations essential to a full understanding of the difficulties that may be encountered in performing the Work; be familiar with the terms and conditions thereof; and acquaint itself with and advise the Core Group concerning the conditions under which the Work is to be performed, including, without limitation, laws, codes and other restrictions on CM/GC's and Subcontractors' operations, local labor conditions, local weather patterns, restriction in access to and from the Project site, prior work performed by others on the Project, and obstructions and other conditions relevant to the Work, the site of Work and its surroundings. With the exception of conditions which qualify under the Differing Site Condition clause, and subject to right to

access the IPD Team Performance Contingency, CM/GC expressly assumes the risk of any variance between the actual conditions, either discovered or discoverable through reasonable investigation in the performance of contractual obligations under the Contract Documents and the Joint Site Investigation Plan, and the conditions shown or represented in the Contract Documents" (IFOA, p. 34).

"The parties agree that the existence of differing site conditions shall not be the basis of a claim of error or omission against the Architect, Engineer or CM/GC or their respective Consultants, provided that the applicable party has exercised due care in reviewing available information concerning conditions at the site, participated in development of the Joint Site Investigation Plan, and performed the level of investigation selected by Owner" (IFOA, p.36).

- *Risk of Errors, Inconsistency or Omission Related to Field Measurements in Contract Documents*

  "To allow Architect or Engineer to make corrections, CM/GC and Subcontractors shall, sufficiently in advance of undertaking Work, take field measurements and verify field conditions and carefully compare such field measurements and conditions and other information known to CM/GC or Subcontractors with the Contract Documents. Errors, inconsistencies or omissions discovered shall be reported immediately to Architect, Engineer and Owner in writing" (IFOA, p.39).

  "If CM/GC or Subcontractors perform any construction activity which involves an error, inconsistency or omission in Contract Documents which CM/GC or Subcontractors knew of, or should reasonably have known of, without such notice to Architect, Engineer and Owner, CM/GC and Subcontractors shall bear the cost as provided elsewhere in this Agreement" (IFOA, p.39).

- *Risk of Changing Rules and Regulations*

  "CM/GC shall conduct its operations to comply, at its own expense, with all applicable federal, state and local laws, codes, rules, regulations, orders, judgments and decrees which are in effect at any time prior to or during the performance of Work. All changes to the Drawings and Specifications are subject to the approval of the applicable authorities having jurisdiction.

  Should any laws or ordinances that affect CM/GC's operations be enacted after acceptance of the GMP which cause CM/GC to bear additional costs, Owner shall reimburse CM/GC for such costs" (IFOA, p.40).

- *Risk of Hazardous Materials*

  “To the extent not covered and actually paid by insurance, CM/GC shall indemnify, defend, protect and hold Owner, Architect, Architect's Consultants Engineer, Engineer's Consultants, and the employees of all of them harmless from all costs, expenses, claims, damages, penalties, judgments, liabilities and assessments (including environmental consultants' and attorneys' fees) arising from or in any way connected to any Hazardous Material introduced, released, disposed, or discharged at or onto the site or into the soil, drains surface or ground water, or air as a result of any action or inaction of CM/GC, any Subcontractor, Sub-subcontractor or Supplier, or any persons for whose acts any of them may be reasonably held liable” (IFOA, p.51).

- *Risk of Inexcusable Delay*

  “"Inexcusable Delay" means any delay in Final Completion of the Work beyond the expiration of the Contract Time resulting from causes other than those identified as Excusable or Compensable, above. An Inexcusable Delay shall not entitle CM/GC to an extension of the Contract Time or an adjustment of the Contract Sum/GMP” (IFOA, p55).

- *Risk of Damage to the Property*

  “To the extent that damages caused by CM/GC, its Subcontractors or Suppliers to completed or partially completed construction or to property of Owner or separate contractors is not covered and paid by the Owner's builder's risk policy or the OCIP, CM/GC, without increase in the GMP, shall promptly remedy damage caused by CM/GC its Subcontractors or Suppliers to completed or partially completed construction or to property of Owner or separate contractors.

  If such separate contractor initiates legal or any other proceedings against Owner on account of any damage alleged to have been caused by CM/GC or its Subcontractors or Suppliers, Owner shall notify CM/GC, who shall defend such proceedings at its own expense, and if any damage, judgment, or award against Owner arises therefrom, CM/GC shall pay or satisfy it and shall reimburse Owner for all attorneys' fees and court or other costs incurred by Owner. Owner shall be reimbursed by the legally responsible party, for damages incurred by Owner which are payable on a comparative fault basis, to a separate contractor because of delays, improperly timed activities or defective Work or Services” (IFOA, p.94).

- *Risk of lien after receiving payments*

"CM/GC shall defend, indemnify and hold Owner harmless from any and all liens, Claims, security interests or encumbrances filed by CM/GC, Subcontractors, Suppliers, or other persons or entities entitled to make a Claim by reason of having provided labor, materials and equipment relating to the Work, provided CM/GC has received payment pursuant to this Agreement" (IFOA, p.79).

"Acceptance of Final Payment by Architect, Engineer or CM/GC shall constitute a waiver of all claims by that payee against the Owner or the Project, except those claims previously submitted in writing and identified in writing as unresolved at the time of its Final Payment Application" (IFOA, p.83).

6.3.3 Risk Financing Strategies

Table 6-9 illustrates risk management strategies implemented in "PROJECT ONE".

Table 6-9: Risk financing strategies in "PROJECT ONE"

Risk Financing Strategies		
Contingency	IPD Team Contingency	
	Professional Insurance Contingency	
	Owner Contingency	
Insurance	Owner's Insurance	Owner Controlled Insurance Program ("OCIP") insurance
	Architect's Insurance	Commercial General Liability (excluding professional liability coverage).
		Workers' Compensation
	Contractor's Insurance	Automobile liability insurance
		Worker's compensation and employer's liability insurance
		Commercial general liability
		Excess liability insurance
		Property insurance
At risk amount	Contractor's at risk fee	
	Architect's at risk fee	
	Engineer's at risk fee	
Waivers	Waiver of Liability (No Suit Clauses)	
	Mutual Waiver of Subrogation between Owner and Architect/Engineer	

	Waiver of Consequential Damages between the key IPD players, and also between the contractor and the subcontractors
Indemnity: provided by Architect, Engineer, CM/GC for claims caused by their actions to the extent of their insurance coverage	
Warranty provided by CM/GC to Owner for a period of one year after final completion	
Dispute Resolution: Series of Negotiations thru: 1. Special Meeting, 2. Core Group Consideration, 3. Senior Executive Meeting, 4. Independent Expert, 5. Mediation.	

6.3.3.1

6.3.3.2 **Contingencies**

- *IPD Team Contingency*

  "In its Cost Models, CM/GC shall carry the IPD Team Performance Contingency, "Escalation," each in an amount to be agreed upon by the Core Group" (IFOA, p.23). "CM/GC shall not include contingency in the Project Cost Model to address refinement of designs, materials, or equipment; instead, CM/GC shall include realistic pricing based upon its listed assumptions and understandings concerning the scope of work, labor, materials, and equipment required by the pending design" (IFOA, p.23).

  "The IPD Team Performance Contingency shall cover increases in the estimated construction costs as a result of refinement or development of the Project design (but not increases in scope or square footage by the Owner). Upon establishment of a GMP, the GMP's Cost of the Work shall include the current balance of the IPD Team Performance Contingency, which shall not be less than 4% of the Cost of the Work, ("Cost of Work" for purposes of this calculation does not include CM/GC's general conditions and fee in amounts carried in the GMP) The IPD Team Performance Contingency shall cover all additional or extra Costs of the Work that CM/GC may incur in performing the original scope of Work set forth in the Contract Documents as a result of all conditions and events that do not entitle CM/GC to a Change Order. The IPD Team Performance Contingency shall also cover all additional cost of the Architect, Architect's Consultants, Engineer, and Engineer's Consultants that are not the result of Owner changes in scope. Neither CM/GC, Architect or Engineer shall be entitled to draw against the contingency without the Core Group's prior written approval, which consent shall not be unreasonably withheld. Unused IPD Team Performance Contingency shall be distributed in accordance with an incentive program to be adopted by the Core Group" (IFOA, p.30).

"The Core Group shall meet at least monthly, beginning with commencement of construction to assign Change Orders or requests to access the IPD Team Performance Contingency" (IFOA, p.36).

- *Professional Insurance Contingency*

"CM/GC, Architect and Engineer shall credit collectively $600,000, of their fees to be allocated to the Professional Insurance Contingency, said credit to be decided among CM/GC, Architect and Engineer and provided to Owner in writing upon Core Group's execution of an incentive agreement. The Professional Insurance Contingency shall be used to cover the deductible cost should a claim or claims be filed against the Professional Liability Policy in accordance with the Provisions of Exhibit 6 of this Agreement. Should the Professional Insurance Contingency have a positive balance at the signing of the final completion certificate for the project, the balance will be credited back to the CM/GC, Architect and Engineer in proportion to the contribution (IFOA, p.30).

- *Owner Contingency*

"Owner Contingency" will be carried in the Construction Budget outside CM/GC's Cost Model" (IFOA, p.23).

"An Owner Contingency in the amount of 5% of the total Project Budget shall be established to cover Owner requested changes to square footage or approved design work arising from errors and omissions by the Architect or Engineer, directives by Agencies having Jurisdiction (AHJ's) that are not previously known by the Architect, Engineer, or CM/GC and toher unforeseen risks that may be realized by the Owner. The Owner Contingency shall not cover increases in the Construction Budget asa result of further development of the drawings and specifications by the Architect or Engineer that is consistent with the contract documents and reasonably inferable therefrom, CM/GC and Subcontractor scope omissions, CM/GC requested overtime or CM/GC requested expedited material delivery. The Owner Contingnecy shall only be used at the direction of the Owner. Remaining funds in the Owner Contingency account will be credited back in full to the Owner at the completion of the project for use at the Owner's direction" (IFOA).

6.3.3.3 **Insurance**

- *Owner's Insurance*

  "Owner has elected to implement an Owner Controlled Insurance Program ("OCIP") for "PROJECT ONE" that will provide Workers' Compensation, Employer's Liability, General Liability and Excess Liability for Construction Manager and all Trade Contractors providing labor to the project. Additionally, Owner will provide Builder's Risk coverage, Contractor's Pollution Liability Insurance, & Professional Liability Coverage" (IFOA, p.141).

  "While the OCIP is intended to provide broad coverage and high limits, the OCIP is not intended to meet all insurance needs of Construction Manager/Trade Contractors. The OCIP does not provide coverage for Automobile Liability, Equipment Floaters or performance bonds for site activities. In addition to any insurance provided by Owner, Construction Manager/Trade Contractors will be responsible for providing certain insurance as specified below. Furthermore, Construction Manager and Trade Contractors must provide their own insurance for off-site activities " (IFOA, p.141).

- *Contractor's Insurance*

  "The Construction Manager and all Trade Contractors who are considered eligible for OCIP enrollment, shall provide certificates of insurance that the following coverages are in force: 1. Automobile liability insurance, 2. Worker's compensation and employer's liability insurance, 3. Commercial general liability insurance, 4. Excess liability insurance, 5. Property insurance for Contractors and Subcontractors tools and equipment" (IFOA, p.151).

  "In lieu of performance and payment bonds, CM/GC shall provide Subcontractor Default insurance" (IFOA, p.89).

- *Architect's Insurance*

Architect and Architect's Consultants shall provide the following insurance coverage and limits: 1. Workers' Compensation, 2. Commercial General Liability (excluding professional liability coverage) (IFOA).

6.3.3.4 **At Risk Amount**

"If not covered and actually paid by proceeds of insurance required by this Agreement and contingencies as set forth in 13.5, Architect's, Engineer's, and CM/GC's respective liability under

the foregoing paragraphs shall be limited to a maximum amount equal to twenty percent (20%) of its fee for negligent errors and omissions and an additional five percent (5%) of its fee for non-negligent errors and omissions. The percentages established are based upon the project delivery method and risk allocation under this Agreement. If Owner materially modifies these items, then Architect, Engineer or CM/GC may propose re revised percentages" (IFOA, p.36).

6.3.3.5 **Waivers**

- *Waiver of Liability (No Suit Clauses)*

"In no event will Architect, Engineer and/or CM/GC be liable to one another except for (i) insurance proceeds actually paid from policies required under this Agreement; (ii) claims arising from fraud or willful misconduct; (iii) fines and penalties; and (iv) damages arising from the abandonment of the Project by a party" (IFOA, p.36).

- *Waiver of consequential damages*

There is a waiver of consequential damages between the key IPD players who signed the joining agreement. These waivers are also extended to the subcontractors through the contract between CM/GC and the subcontractors (ARCHITECT, ENGINEER, Owner, and CM/GC).

"Except to the extent that insurance coverage and proceeds are available and paid under the OCIP, Subguard, project specific professional liability insurance, or any other insurance policy required to be provided by this Agreement in no event shall any party be liable to any other party for any special, incidental, or consequential damages arising in connection with the Work, the Project or the Contract Documents, regardless of the legal theory upon which a claim may be based, including without limitation, contract, warranty or tort" (IFOA, p.35).

- *Mutual waivers of subrogation*

"The Architect and the Engineer waive all rights of action and subrogation against the Owner to the extent of any insurance recoveries that may be obtained by the Architect and the Engineer for damages caused by fire or other peril covered by insurance, except such rights as the Architect and the Engineer may have to insurance proceeds held by any other person as trustee or otherwise on behalf of the Architect and the Engineer, and where prohibited by such policies.

The Owner waives all rights of action and subrogation against the Architect and the Engineer to the extent of any insurance recoveries that may be obtained by the Owner for damages caused by

fire or other peril covered by insurance, except such rights as the Owner may have to insurance proceeds held by any other person as trustee or otherwise on behalf of the Owner, and where prohibited by such policies" (IFOA, pp. 156-8).

6.3.3.6 **Indemnification**

The Architect, the Engineer, and the CM/GC indemnify, hold harmless, and defend the indemnities from and against all claims whatsoever caused by wholly or partly their actions to the extent that insurance coverage exists (IFOA).

- *CM/GC Indemnity*

  "To the extent that insurance coverage exists and is provided under the OCIP, the Project specific professional liability insurance policy, the subguard policy or under any other insurance policy required to be provided by this Agreement which provides coverage to CM/GC, CM/GC shall indemnify, hold harmless, protect, and defend Indemnitees from and against all claims, demands, causes of action, losses and expenses, damages, liabilities, costs, liens, judgments, fines, penalties or obligations whatsoever, including without limitation reasonable attorneys', consultants', and experts' costs and fees, resulting from or in any way caused or contributed to, in whole or in part, by the performance of or failure to perform any obligations under the Contract Documents, or the negligent acts, errors or omissions of CM/GC, or any Subcontractor, Subsubcontractor, Supplier, the officers, partners, employees, consultants or agents of any of them or of anyone for whose acts they may be liable, in connection with the Project. This indemnity obligation shall apply regardless of whether or not the event giving rise to the indemnity obligation is caused in part by the negligence of an Indemnitee, but shall not apply when the loss is caused solely by the negligence or willful misconduct of an Indemnitee. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity or contribution which would otherwise exist as to any person or entity described in this section" (IFOA, pp.86-7).

- *Architect/Engineer Indemnity*

  "To the extent that insurance coverage exists and is provided under the OCIP, the Project specific professional liability insurance policy or under any other insurance policy required to be provided under this Agreement, Architect/Engineer shall defend, indemnify and hold harmless Indemnitees, from and against all claims, demands, causes of action, losses and expenses, damages, liabilities, costs, liens, judgments, fines, penalties or obligations, including, without limitation, reasonable attorneys' fees, experts' and consultants' fees, resulting from or in any way

caused or contributed to, in whole or in part, by Architect's/Engineer's or Architect's/Engineer's Consultants' negligent performance of professional services under or breach of this Agreement. Such obligations of Architect/Engineer hereunder shall extend to claims caused or contributed to by the passive negligence of an Indemnitee. In no event shall the indemnification obligation extend beyond thirty days after the date when the institution of legal or equitable proceedings for professional negligence would be barred by an applicable statute of repose or statue of limitations" (IFOA, pp.87).

6.3.3.7 **Warranty**

"For a period of one year from the date of Substantial Completion, CM/GC warrants to Owner, that materials and equipment furnished for the Project will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents' (IFOA, p.94).

6.3.3.8 **Dispute Resolution**

Per IFOA, the Owner, the Architect, the Engineer and the CM/GC shall attempt to resolve their disputes by reasonable business-like negotiations in accordance with the following procedures, and without resort to litigation.

- *Special Meeting*

  Upon receipt of a Notice of Potential Claim, the affected parties shall attempt to resolve it through direct negotiations at a special meeting ("Special Meeting") which is called solely for the resolution of disputes.

- *Core Group Consideration*

  If the parties are unable to resolve the Claim at the Special Meeting, then the Claim shall be submitted to the Core Group at its next meeting or at a special meeting requested by any party.

- *Senior Executive Meeting*

  If the Core Group is unable to resolve the Claim, any party may request a Senior Management Meeting with the Core Group.

- *Independent Expert*

If the Claim is not resolved within seven (7) days after the Senior Executive Meeting, then the Core Group may appoint one or more independent, third-party experts ("Independent Expert") to review the Claim.

- *Mediation*

  If the dispute has not been resolved as provided above, any party may, at its option, initiate mediation proceedings in which the remaining parties shall participate.

6.3.4 **Incentives**

Table 6-10 illustrates incentives criteria, source of funding, and incentive allocation among the team in "PROJECT ONE".

Table 6-10: Incentives in "PROJECT ONE"

Incentive Criteria	Source of funding	Distribution of incentive		
		Owner	Architect	CM/GC
• Early completion of the job	Reduction in the project's costs	XX	X	X
• Staying within budget and saving IPD team contingency	Shared IPD team contingency preservation		X	X
• Buying owner the alternates • Innovation • Lean	Shared professional insurance contingency		X	X

In support of Lean Project Delivery, the Core Group, including the Senior Management Representatives, shall develop a financial incentive program as they deem appropriate to encourage successfully achieving superior performance and exceeding the Project Evaluation Criteria.

Any incentive program should provide a basis for continually monitoring and reviewing the project team's performance, providing the team with periodic performance information to allow corrections or modifications during project performance to improve the quality of the services provided. The program should be funded with project savings as evidenced by contingency preservation and reduction in the Project's Costs of the Work as compared to the amounts contained within the GMP. The program should consider performance in the following areas: cost, quality, safety, schedule, planning system reliability, and innovative design or construction processes (IFOA).

The incentive plan was added as an addendum one year after the contract was developed. It was signed in August 2010 when the design phase was almost complete. The incentive encourages the following: 1. Early completion of the job; 2. Staying within the budget and saving the IPD team contingency; 3. Buying the Owner the alternates, 4. Innovation (Owner).

The incentive offers monetary bonuses to the team if they can finish the job early. Furthermore, the team has incentive to save the IPD team contingency; as the un-used contingency will be returned and distributed among the team. The owner also puts in place some incentive for the team to buy the owner some alternates. The alternates cost $1.7 million and are not part of the contract scope; however, if the team could purchase those through their bid saving and contingency saving, the owner would reward them $1 million to split among them. The team believes that they could manage their IPD contingency and will be able to buy the Owner those alternates. Currently, the project is only 5% through construction, and the team thinks that it is too early for them to pursue this decision (CM/GC).

6.3.4.1 **Replenishment of project saving**

The financial agreement is structured in a way that if the project is completed under budget, the unused fund would be first reimbursed to the Owner based on the amount indicated in the agreement, and then what is left would be shared among the key IPD players. Thus, all the parties in the project are incentivized to complete the project on time and under budget.

6.3.4.2 **Replenishment of the IPD team contingency**

The IPD team contingency is shared between the CM/GC, the Architect and the Engineer for any change that is not considered as a change order.

> "The IPD Team Performance Contingency shall cover increases in the estimated construction costs as a result of refinement or development of the Project design (but not increases in scope or square footage by the Owner). Upon establishment of a GMP, the GMP's Cost of the Work shall include the current balance of the IPD Team Performance Contingency, which shall not be less than 4% of the Cost of the Work, ("Cost of Work" for purposes of this calculation does not include CM/GC's general conditions and fee in amounts carried in the GMP) The IPD Team Performance Contingency shall cover all additional or extra Costs of the Work that CM/GC may incur in performing the original scope of Work set forth in the Contract Documents as a result of all conditions and events that do not entitle CM/GC to a Change Order. The IPD Team Performance Contingency shall also cover all additional cost of the Architect, Architect's Consultants, Engineer, and Engineer's Consultants that are not the result of Owner changes in

scope. Neither CM/GC, Architect or Engineer shall be entitled to draw against the contingency without the Core Group's prior written approval, which consent shall not be unreasonably withheld. Unused IPD Team Performance Contingency shall be distributed in accordance with an incentive program to be adopted by the Core Group" (IFOA).

6.3.4.3 Replenishment of shared professional insurance contingency

The CM/GC, the Architect and the Engineer shall credit collectively $600,000 of their fees to be allocated to the Professional Insurance Contingency. The Professional Insurance Contingency shall be used to cover the deductible cost should a claim or claims be filed against the Professional Liability Policy. Should the Professional Insurance Contingency have a positive balance at the signing of the final completion certificate for the project, the balance will be credited back to the CM/GC, the Architect and the Engineer in proportion to the contribution (IFOA).

6.3.5 Process Management

Early involvement of the CM/GC and the Trade contractors in "PROJECT ONE" enables collaborative services, such as Target Value Design, Design Assist, Value Analysis, Value Engineering, and Constructability Analysis during pre-construction phase. Process and operation management during construction follows lean principles. Table 6-11 exhibits the process management features of "PROJECT ONE".

Table 6-11: Process management in "PROJECT ONE"

Process Management	
Pre-construction	Early involvement of trade contractors, 3D models coordination drawings
	Project planning and scheduling: Pull scheduling using the Last Planner System
	Target Value Design support services provided by CM/GC and trade contractors
	Value Analysis services provided by CM/GC and trade contractors
	Value Engineering services provided by CM/GC and trade contractors
	Constructability Analysis services provided by CM/GC and trade contractors
Construction	Lean principle, including 5s Plan

6.3.5.1 Pre-construction

- *Coordination Drawings*

"During the preconstruction phases, Trade Contractors shall participate in three dimensional modeling to identify routing and eliminate conflicts in the work of the various trades. At the option of the CM/GC, the Trade Contractors may be required to furnish coordination drawings for the same purpose" (IFOA, p.13).

- *Project planning and scheduling*

The planning and scheduling to be performed on the project shall be "pull scheduling" using the Last Planner System™, or an equivalent system.

At a minimum the system must include a milestone schedule, collaboratively created phase schedules, "make-ready" look ahead plans, weekly work plans, and a method for measuring, recording, and improving planning reliability (IFOA, p.11).

- *Target Value Design*

"Target Value Design is intended to make explicit that value, cost, schedule, and constructability (including work structuring) are basic components of the design criteria. The Core Group shall develop written guidelines or protocols for use of Target Value Design principles throughout the design process" (IFOA, p.20).

"Cost and schedule are design criteria, and it will not be tolerated to only have those issues reviewed at the milestones described below. The Core Group shall establish protocols and procedures so that design proceeds fully informed by the cost and schedule implications of the design" (IFOA, p.10).

The CM/GC and the Trade Contractors have provided Target Value Design support services throughout development of the design. The "roll-up estimates" or "gate estimates" provide the Owner the opportunity to confirm that the entire Project, at those milestones, is proceeding within the approved Construction Budget parameters. Those estimates shall be the by-product of the continuous target value pricing process and are not intended to be performed by progressing the documents to a certain stage of development and then requesting that the CM/GC and the Trade Contractors provide pricing information. As noted, the CM/GC and the Trade Contractors are also expected to provide on-going cost information and estimating of portions of the Work, systems being considered, details as they are developed, and other cost exercises that the Core Group deems advisable. Formal estimates shall include the IPD Team Performance Contingency, and a contingency for escalation in labor and material prices as provided by the Core Group (IFOA).

- *Value Analysis Strategy*

Throughout the pre-construction phase, with particular attention during the SD and DD phases, and as part of the Target Value Design process, the CM/GC and the Trade Contractors shall continuously be pursuing opportunities to create additional value by identifying options to reduce capital or life cycle cost, improve constructability and functionality, or provide operational flexibility, while satisfying the Owner's programmatic needs. In order to avoid waste associated with re-drawing aspects of the Work, the emphasis on deep value analysis and the opportunity for set-based design (carrying multiple design options forward and deferring decisions until the last responsible moment) must be emphasized early in the design process. In order for these efforts to be effective, the Project must gain the early involvement of the Trade Contractors who possess information essential to the Value Engineering ("VE") process. The Core Group should focus on developing strategies to include value analysis as part of its Target Value Design efforts (IFOA).

- *Value Engineering Proposals*

  "CM/GC and the Trade Contractor shall be encouraged to bring forward alternative systems, means, methods, configurations, site locations, finishes, equipment and the like that satisfy the general design criteria of the Project, but which result in savings of time or money in constructing or operating and maintaining the Project, or increasing quality, constructability, or other measures of value and are cost neutral. Each VE Proposal ("VEP") shall examine the proposed change, identify all aspects of the Project directly or indirectly affected by the change, specify the cost or time savings to be achieved if the YEP is accepted, and detail any anticipated effect on the Project's service life, economy of operation, ease of maintenance, appearance, design or safety standards" (IFOA, p.28).

- *Constructability*

  "CM/GC and Trade Contractors shall continually review the Design Documents for clarity, consistency, constructability and coordination among the design disciplines' drawings and the construction trades and collaborate with the IPD Team in developing solutions to any identified issues. Unless otherwise directed by the Core Group, CM/GC shall conduct two formal, documented Constructability Reviews: when the Construction Documents are fifty percent (50%) complete and when the Construction Documents are ninety percent (90%) complete" (IFOA, p.28).

6.3.5.2 **Construction**

- *"5S" Plan*

The CM/GC and the Subcontractors shall develop and implement a "5S" plan for the Project. The plan shall address the following elements: 1. Sort, 2. Set in Order, 3. Shine/Sweep, 4. Standardize, 5. Sustain/Self-Discipline (IFOA, p.38).

6.3.6 **Contract Characteristics**

The contract is characterized as relational. The Integrated Form of Agreement (IFOA) is between the Owner, the Architect, the Engineer, and the CM/GC.

> However, as stated in the IFOA, "by appropriate written agreement, Architect, Engineer and CM/GC, as applicable, shall require each Subcontractor, Supplier, Architect's Consultant or Engineer's Consultant to be bound by terms of the Contract Documents, and to assume toward Owner and Architect, Engineer or CM/GC, respectively, all the obligations and responsibilities, including responsibility for safety, which the primary party assumes by these documents" (IFOA, p.89).

According to the IPD Core Team, the agreement is a non-standard contract, and a modified version of Sutter Health with a self-customized incentive plan.

The agreement, for the most part, was prepared by the owner. The Owner together with the team made a second revision and came to agreement on the final draft. The agreement had been signed before schematic design was issued. It includes target budget for the project (CM/GC).

6.4 IPD Principles

Table 6-12 presents the IPD principles and characteristics that are implemented in "PROJECT ONE". The chart is taken from chapter 3 of this dissertation, and it is the result of literature review and analysis on the qualities defining IPD characteristics. A check mark (√) indicates the principles which are applied and (X) indicates the ones which are not applied in this project.

Table 6-12: IPD principles and characteristics applied in "PROJECT ONE"

IPD Principles and Characteristics		
Contractual Principles of IPD	Shared financial risk and reward	√
	Liability waivers between key participants	√
	Fiscal transparency between key participants	√
	Early involvement of key participants	√
	Intensified early planning	√
	Jointly developed project target criteria	√
	Collaborative decision making and control	√
Behavioral Principles of IPD	Mutual respect and trust	√
	Willingness to collaborate	√
	Open communication	√
	Collaborative innovation	√
	Reliable promising	√
	Acting in the best interest of the project	√
Relational Contract Type	Single multi-party contract	√
Catalyst to IPD	Lean techniques	√
	BIM	√
	Co-location of the team	X
	Organization & leadership	√

6.4.1 Contractual Principles of IPD Applied in “PROJECT ONE”

A few contractual principles are further explained below.

6.4.1.1 Fiscal transparency to the Owner

“IPD Team Members' records, which shall include but not be limited to accounting records (hard copy, as well as computer readable data if it can be made available), written policies and procedures; subcontract files (including proposals of successful and unsuccessful bidders, bid recaps, etc.); original estimates; estimating work sheets; correspondence; Change Order files (including documentation covering negotiated settlements); backcharge logs and supporting documentation; general ledger entries detailing cash and trade discounts earned, insurance rebates, deductions, and dividends; and any other supporting evidence deemed necessary by Owner to substantiate charges related to this Contract (all foregoing hereinafter referred to as "Records") shall be open to inspection and subject to audit and/or reproduction by Owner's agent or its authorized representative upon Owner's reasonable request. Owner may also conduct verifications such as counting employees at the Project Site, witnessing the distribution of payroll, verifying information and amounts through interviews and written confirmations with employees, subcontractors, and material suppliers” (IFOA, p.85).

6.4.1.2 Early involvement

“It is anticipated that CM/GC will contract with necessary Trade Contractors and Suppliers, as approved by the Core Group, to provide pre-construction services as described in the Contract Documents. It is anticipated that key trades will be retained during schematic design to facilitate an integrated, collaborative design process. For these key trades, Owner anticipates that proposals will be solicited on a Request for Proposal basis and that selections will be made in collaboration with the Core Group” (IFOA, p.13).

CM/GC contracts with necessary Trade Contractors and Suppliers, as approved by the Core Group, to provide pre-construction services as described in the Contract Documents. Key trades have been retained during schematic design to facilitate an integrated, collaborative design process (CM/GC).

In order to achieve Owner’s basic value proposition, design of the Project must proceed with informed, accurate information concerning program, quality, cost and schedule. While each IPD Team member will bring different expertise to each of these issues, all of these issues and the full weight of the entire team expertise will need to be integrated throughout the preconstruction process if the value proposition is to be

attained. None of the parties can proceed in isolation from the others; there must be collaboration and continuous flow of information.

The subcontractors are heavily engaged with the process such as early budgeting. They also attend the meetings where the Owner communicates their expectations in terms of services, product, and warranty. According to the IPD core team, the early engagement of the Subcontractors in the process has mitigated miscommunication and misunderstanding related issues.

During the preconstruction phases, the Trade Contractors shall participate in three dimensional modeling to eliminate conflicts in the work of the various trades. At the option of the CM/GC, the Trade Contractors may be required to furnish coordination drawings for the same purpose.

6.4.1.3 Collaborative decision making

As outlined in the IFOA, the Core Group makes decisions by unanimous vote, however in the absence of unanimity, the Owner may issue directions that it believes to be in the best interest of the Project subject to challenge in accordance with the dispute resolution portion of the Agreement. The Owner's Representative (PM) is a non-voting member of the Core Group.

6.4.2 Behavioral Principles of IPD Applied in "PROJECT ONE"

Through signing the IFOA agreement, the contracting parties acknowledge their commitments to the IPD behavioral principles.

Some of the IPD behavioral principles are further elaborated below. The following citation is from the IFOA and is signed by the IPD Core Team:

6.4.2.1 Mutual Respect and Trust

The parties accept the relationship of mutual trust and confidence established with each other and promise to furnish skill and judgment consistent with the applicable standard of care for each party.

The parties recognize that each of their opportunities to succeed on the Project are directly tied to the performance of other Project participants. The parties shall therefore work together in the spirit of cooperation, collaboration, and mutual respect for the benefit of the Project, and within the limits of their expertise and abilities, and in accordance with the applicable standards of care (IFOA).

6.4.2.2 **Reliable Promising**

Fundamental to the success of Lean Project Delivery is the Willingness and ability of all IPD Team members to make and secure reliable promises as the basis for planning and executing the project (IFOA).

6.4.3 **IPD Catalyst Applied in "PROJECT ONE"**

6.4.3.1 **Lean strategies**

The contract enforces implementation of lean strategies, such as pull scheduling and 5s Plan in operation of the project.

- *Pull scheduling*

According to the IFOA, the planning and scheduling to be performed on the project shall be "pull scheduling" using the Last Planner System™, or an equivalent system. In order to be pull-based, the planning system must be based upon requests from IPD Team members to other project performers upon whom the requester's work is dependent, and commitments made by the up-stream performer about when it will finish the work to agreed-upon hand-off criteria, in order to enable the downstream performer to begin its performance. At a minimum the system must include a milestone schedule, collaboratively created phase schedules, "make-ready" look ahead plans, weekly work plans, and a method for measuring, recording, and improving planning reliability.

The Pull Scheduling technique is an interactive process that allows each of the project team members to outline the tasks they need to accomplish and the time frame for these tasks while simultaneously indicating the information or input needed from other team members in order to accomplish each task. By working in a collaborative manner, a mutual understanding of each team member's role in meeting the overall schedule can be achieved.

In order to establish a "pull schedule", in "PROJECT ONE", typically there are two pull session meetings: 1. there is one pull session where every party in the project attends. It looks at the 8 months ahead schedule at a macro level; 2. There is another pull session where General Contractor and all Subcontractors attend. This pull session would looks at the 6 weeks ahead schedule. The schedule offers more detail, and includes hundreds of activities (CM/GC).

- *Construction phase operations*

"5S" Plan: CM/GC and the Subcontractors shall develop and implement a '5S' plan for the Project. The plan shall address the following elements:

Sort: Removing clutter and all unnecessary items from the work environment, items are brought or stored only when they are needed and are removed from the site when no longer required. Applies to paper, drawings, and other office items, as well as materials and equipment.

Set in Order: Identifying the location where items will be used and placing those items close at hand creates a place for everything and requires that everything be put in its place. Items and storage vessels are clearly labeled or marked.

Shine/Sweep: Creating an orderly and clean workspace with continuous clean-up visual and physical protocol for continuous disposal of refuse; schedule for regular clean-up; visual displays to support.

Standardize: Publishing 'standard practices' for implementing the 5S program, but constantly looking to improve the standards.

Sustain/Self-Discipline: Creating the expectation that satisfying the plan covering the first four elements is the minimum, and that performers are expected to continually evolve and improve the systems (IFOA).

6.4.3.2 **BIM**

The CM/GC utilizes Building Information Modeling (BIM) to enhance the IPD Team's efforts throughout the design and construction phases of the project. BIM files are updated and maintained by the CM/GC, and are filed in e-Docs (CM/GC).

6.4.3.3 **Co-location of the team**

Even though co-location of the project participants "Big Room" is recommended by IPD practices, at "PROJECT ONE" colocation has not been the option. Project participants are physically removed: CM/GC's and Engineer's office is at Nashville, Architect's office is located at Milwaukee, and the project is at Kentucky. As a result, it was difficult to co-locate the team and have a "Big Room". Instead the team meets in smaller cluster groups to solve the issues. Occasionally, multiple groups come together in a single location for integration and coordination purposes. Often the meeting room is referred to as a BIM Room where parties work out coordination issues.

According to the IPD Core Team, most of the work is done digitally. The team uses Webex. However, as the CM/GC notes, the "Big Room" forces people to get together, look at each other, think together, make decisions, and act. A Big Room fosters relationship building and promotes trust and collaboration.

6.4.3.4 **Organization and Leadership**

In "PROJECT ONE", the owner hired a Project Management company to provide this leadership on behalf of the Owner.

6.5 Comparative Analysis of IPD and a Traditional Delivery Approach

Through the open-ended questionnaire, the key IPD players were asked to reflect on their experience with the IPD approach; and to discuss how IPD has changed their responsibilities, liabilities, risk exposures, and overall the way they used to carry out a similar project in a traditional delivery fashion. Below is the result of the IPD team responses.

6.5.1 Changes in Roles and Responsibilities of Participants

- *Changes in roles and responsibilities of the Architect, the CM/GC, and the Engineer: Similar roles and responsibilities as traditional delivery approach but with more involvement and authority*

In IPD, individuals are not only responsible for their own actions, but also for the performance of their team partners, as individual's success is tied to team success. As a result, even though contractually parties have similar roles and responsibilities as a traditional delivery approach, in practice they take more responsibility and initiative to ensure team success (CM/GC).

For example in "PROJECT ONE", compared to a conventional delivery approach, the CM/GC is more invested in the development of design, and the Architect is more invested in budget management during the design phase.

Overall, the entire team, the CM/GC, the Architect, and the Engineer aspired to more transparency. They have more responsibility and involvement while at the same time they have more authority and ownership of the project (Architect).

- *In IPD, the Owner is more of a player on the team and less of a coach*

In IPD, the Owner is more of a player on the team and less of a coach. The financial responsibility, however, is the sole responsibility of the Owner just like in a traditional delivery approach.

Under a traditional delivery model, the Owner is usually a primary decision maker while the team members present recommendations and supporting documentation for the Owner to make the final decision. In IPD, comparatively, while the owner defines the overall project scope throughout the project there is a great deal of communication and collaboration between the team and the Owner, and decisions are made collaboratively. Thus, the Owner spending time on the front end getting the best team members would be of paramount importance in ensuring project success.

A good analogy is a sport team; when the team is formed of the best players, the coach lets the team play with a confidence that they will succeed. In IPD, the Owner is more of a player on the team and less of a coach.

Comparatively, in a traditional delivery approach, as a coach, the Owner keeps directing the team. There is a pyramid hierarchy organization. The team looks up to the owner for a command. The owner needs to invest more time and energy to direct the team and the result may not be as good as if the players were also involved and had ownership in decision making (Owner).

- *In IPD setting, the owner's project manager spends less time resolving disputes, and instead, they focus their time to be more innovative and creative on performing their traditional roles*

As the Owner's rep, the Project Manager describes its role in a traditional delivery approach as follows: maintaining schedule and budget, driving the Architect, and the Contractor, seeking collaboration between silos of professionals, mitigating disputes between them, and making sure that the project is running smoothly as planned.

Compared to a traditional delivery approach, in "PROJECT ONE", the team demonstrates a greater bond and a trusting relationship because they have agreed to act according to the IPD principles. As a result there is more collaboration, less adversarial relationships between the team and fewer disputes. Thus, as the owner's rep, the PROJECT MANAGER's role has shifted a little bit; they spend less time to resolve disputes and make teams collaborate, and instead, they focus their time and energy to be more innovative and creative on performing their traditional roles. They act more as an advisor to the team than a director or manager.

While IPD principles can be applied in any traditional delivery process, it is proved that it is more effective if the IPD principles are incorporated in a contract where the parties are legally liable to act according to these principles (PM).

6.5.2 **Changes in Liabilities**

In a traditional setting, liabilities for design errors and omissions or changes in budget are allocated to individuals. Comparatively, in an IPD setting, in most cases liabilities are shared among the team.

- *In an IPD setting, liability for design errors and omission is shared as it relates to contingency expenditure*

Example: The Architect submits a full construction document. After a while he realizes that he forgets to include some pieces in the design and as a result that piece is not included in the General Contractor's budget. In a traditional project delivery, the risk of design errors and omission is usually allocated to the Architect and the Owner depending on the contract. In a traditional delivery, such problems immediately become a conversation about errors and omissions with the Owner, and a discussion of who should pay for it.

Usually, the Owner would pay for the missing item if it is a value-added omission and the owner would have had to pay for it anyway. However, if the timing is such that the Architect finds the mistake and it involves extra cost more than the piece itself then the Architect is responsible for the extra charge, and also for his design time. For instance, if the timing of finding the error results in rework, often times the Architect is responsible for the premium associated with the rework.

Comparatively, in an IPD setting like in "PROJECT ONE", there is a team contingency that the team could use to fund such issues. The team also has a shared insurance policy. However, the insurance will only come to play if the entire contingency is spent, and the issue is significant enough that would merit going to insurance. In other words, the whole team is penalized for the design errors and omission. As a result, the team partners would collaborate and look after each other to make sure that the project is error free. Using a shared team contingency aligns parties and makes the team more integrated and collaborative (Architect).

- *In an IPD setting, the CM/GC assumes liability for a budget change when it is caused by any party except the Owner*

According to the CM/GC, in an IPD setting, their liability towards budget is changed compared to a traditional delivery approach. In a traditional project, a CM/GC is not liable for a change in budget, if the change is caused by a design change initiated by a party other than the CM/GC. Comparatively, in an IPD setting, like in "PROJECT ONE", the CM/GC is liable for a budget change resulting from a design change caused by any party except the Owner.

Example: In "PROJECT ONE, in the interest of the schedule, the Core Team agreed that the CM/GC installs the light poles in the parking lots even though drawings were not 100% complete. After the light poles were installed, the team found out that nine of the poles needed to have security imbedded in them.

The first solution comes to mind is that CM/GC must tear those poles out and install new ones. The question is who would pay for the extra cost of tearing out, buying, and installing new ones?

In a traditional setting, normally the team argues that it is CM/GC's responsibility and they have to pay as they proceeded at risk. Comparatively in an IPD setting, the team would realize that they, as a core team, made this decision collaboratively, and thus they are all responsible for that.

In this project, the team agreed that the extra cost should be funded through the Core Team contingency pool, and that such a mistake would impact the whole team and not just one individual. The team realized that they need to collaboratively come up with the least expensive solution, and use the core team contingency to fund the project (Architect).

As seen through this example, collaborative decision making, and allocating shared contingency changes the team behavior on how they approach a problem. Collaborative decision making and shared contingency break the silos and boundaries between professions. It aligns the interests of the team partners toward the best interest of the project. As a result, it promotes collaboration, innovation, and prevents the destructive culture of blame and finger pointing.

6.5.3 Changes in Risk Exposure

Compared to a traditional delivery project, the Architect, the Owner, and the Project Manager believe that their risk exposure have been decreased in this IPD project. The CM/GC believes that its risk exposure has not changed in this project.

Table 6-13: Changes in the participants' level of risk exposure in IPD compared to a traditional setting according to the IPD participants in "PROJECT ONE"

Parties	Changes in risk exposure compared to a traditional delivery approach according to the IPD Participants
Architect	Decreased
Project Manager	Decreased
Owner	Decreased
Contractor	Remained the same

- *More Risk Exposure, less risk intensity*

In a traditional project, if something goes wrong and a lawsuit is claimed, often time contracting parties blame each other for the issue. A tremendous amount of time and money is wasted on litigation. Whereas in an IPD setting, if something goes wrong everyone gets united to address the issue, as they all share risk. IPD offers a better mechanism for dealing with issues. Even though everyone seems to take on more risks in an IPD setting, in reality the intensity of risk faced by each individual is much lower (CM/GC).

- *Similar to traditional setting, in IPD the Owner still takes the most risk*

In general, the Owner has an enormous amount of risk on any project as they ultimately carry financial risks. In "PROJECT ONE", even though the IPD contract aspires to share the risks among the parties equally, the owner is the one with highest risk exposure (Owner, Architect, PM).

6.5.4 Changes in the Process Management

6.5.4.1 Interaction

- *IPD setting promotes interaction among project participants.*

In IPD there is increased interaction among project participants. For example, meetings such as design integration meeting, core group meeting, and senior group meeting are almost unique to IPD setting (Architect).

In traditional projects there are OAC meetings where the discussion is mainly about the project and RFIs. Comparatively, the Core Team meeting and Senior Management group meeting in the IPD setting is more dedicated to how the project is managed rather than just discussing technical design and construction issues (PM).

In a conventional delivery method the Architect may have an initial contract with the owner to work on planning and programing of a building before they sign the main contract for the actual design. Compared to the project initiation phase in IPD project, the major difference here is that the Architect and other parties in a conventional approach each works on their individual contracts with the owner, and there is a limited discussion, if any, among different parties on how they are actually going to work together, meet, and collaborate (PM).

6.5.4.2 Decision making authority

- *Unlike a traditional setting where the Owner is the key decision maker, in the IPD setting decisions are made collectively by the representatives of the IPD team members*

In an IPD context, decisions are made collectively by representatives of each IPD participants within boundaries created by board and owner executive team. Compared to a traditional model, the Architect, the CM/GC, and the Project Manager have more authority/ more involved, while the Owner has less authority/as involved (Core IPD Team).

IPD context provides team members with a greater opportunity to freely express their ideas, and steer the project to the direction they deem appropriate for the project if that is approved by the majority vote. Comparatively, in a traditional delivery approach, the Owner has the sole authority in dictating how the team should proceed, regardless of what the team members may seem appropriate. In a way, the traditional delivery process is like a dictatorship and IPD is more like a democracy. The two represent different leadership styles (CM/GC).

6.5.4.3 **Open dialogue**

- *Unlike a traditional approach, risk sharing attributed to IPD encourages information sharing and open dialogue.*

In a traditional delivery process where risk is allocated to parties, often time project participants are reluctant to contribute knowledge and make assumptions at the early stage of the project. They fear that their assumption may be incorrect and they may be held accountable by the team for their incorrect assumption or bad decisions.

Comparatively, in an IPD setting, risks are shared, and decisions are made collectively. As a result parties are more open to information sharing. They engage in an open dialogue, without fearing for potential claims, lawsuits, or blame. From the very early phase, they all contribute to the decision making and make assumptions. They understand that they can change their assumptions for the best of the project as they proceed and things become clearer (CM/GC).

Risk sharing encourages open dialogue and information sharing.

6.5.4.4 **Target Value Design**

- *In IPD, design and budget management efforts occur concurrently, while in a traditional setting the cost estimating and budget management efforts follow each design phase.*

In a traditional delivery approach the project cost is evaluated at the conclusion of each phase: schematic design, design development, and construction document. If the evaluation indicates a budget

overrun, the Architect would re-design to the budget. In projects where there is less collaboration and coordination, the Architect would spend an enormous amount of time to solve the issues in the field. That extra effort is not usually compensated; however it depends on the contract.

Comparatively, in an IPD project like in "PROJECT ONE", the Architect tries to avoid such re-works through enhanced communication with the team, better understanding of the project scope, continuous collaboration on budget management with the CM/GC, and coordination with the MEP Engineers.

In the end, through enhanced collaboration, communication, and coordination (C3) the risk of re-designing is mitigated significantly. "PROJECT ONE" is excellent proof of this argument (Architect).

6.5.4.5 **Change management**

- *Change management process in IPD is much easier and less time consuming.*

It is much easier to make changes in IPD than in the traditional delivery process.

In IPD, the team shows more flexibility to re-think project parameters and the process and constantly improve the process if such a change yields more benefits to the project in the end. Comparatively, in a traditional delivery, making changes to a project is uneasy and time consuming (CM/GC).

6.5.4.6 **Leadership**

- *In IPD team members participate in leadership efforts and take a more proactive role in steering the project to the right direction*

In IPD, the team keeps each other in check and balance. Every team member puts in efforts to make sure that the team is heading to the right direction to meet the project goals, and not just their individual goals. Comparatively, in a traditional delivery process, usually it is just the owner who has to make sure that everybody is heading to the right direction (CM/GC).

6.6 Trust Development Process

The information in this section is the combinatorial results of the interviews with the Core IPD team members. Through a series of open-ended questions participants are asked to define trust, discuss the parameters that are effective in establishing trust, promoting trust, and advancing participants' sense of belonging to the project. In the end, a table is developed that includes all the influential factors that result in building trust-based relationships. Based on the nature of the influential factors, conclusions are made to demonstrate if/how a contract or project participants are effective in trust-based relationships

6.6.1 Definition of Trust

The members of the core IPD team were asked to define trust. Following are their definitions of trust.

- *Honesty and honoring promises*

Trust is to believe in someone without reservation, and with confidence that the efforts will be pure even though the result is not going to be perfect, and that the individuals will do what they say they do. Trust is to make and keep commitments (Architect, CM/GC).

- *Honesty and acting in the mutual interest of each other*

Trust means having confidence on someone that he/she is honest, honors his/her promises, and acts on the interest of his/her self and the party with whom he/she has relationship (Architect, CM/GC).

- *Sharing goals and interacting fearlessly*

Trust is believability that one can interact with another without fear and anxiety, and recognizing that the two are trying to achieve the same purpose as quickly as possible. Trust is uninhibited, unguarded feeling between the mutual parties which allows them not to hold something back. Usually people succeed in places where they feel comfortable. They do not excel in places where they are nervous and feel that they have to protect themselves (Owner, PM).

Table 6-14: Definition of trust according to the Core IPD Team in "PROJECT ONE"

Definition of Trust	Mentioned by
Honesty	Architect, CM/GC
Honoring promises	Architect, CM/GC
Goals alignment / Acting in the mutual interest of each other	Owner, PM
Fear/anxiety free interaction, Uninhibited feeling/ Do not need to be protected	Owner, PM

6.6.2 Factors Facilitating Establishment of Trust

Trust is gradually built and developed. The trust- building cycle starts with faith. Faith usually yields an initial level of trust. Once the initial form of trust is tested and verified, trust is promoted to a next level.

Faith-based trust defines the type of trust that is developed usually based on certain existing facts. The following factors facilitate establishment of trust (Table 6-15). Further descriptions on each factor are provided below.

Table 6-15: Factors facilitating establishment of trust according to the Core IPD Team in "PROJECT ONE"

Factors facilitating trust-building efforts
Prior relationship with positive experience
Good reputation
Self-formed integrated team
Mutual respect
Information sharing

- *Prior relationships with positive experience*

Having prior positive experience with the project stakeholders builds initial trust. Individuals who know each other from the past could make a better judgment of each other's ability, level of reliability, and trustworthiness. As a result, their expectations of their partner more accurately correspond with their partner's actual capability (CM/GC).

Trust is built and promoted once expectations are met or exceeded. The PM argued that in projects where individuals know each other, it is easier for them to build trust at the beginning of the project and also trust is more likely to be promoted throughout the process as there would be fewer surprises (PM).

In "PROJECT ONE", the CM/GC has had previous relationship with the MEP Engineer and the Architect, and thus there exists an initial level of trust between them. While the company's reputation is important the people who represent the company in the project is what truly matters (CM/GC).

- *Reputation and a desire for continuing work opportunities*

An individual company's reputation and a desire for continuing opportunities enhance one's reliability but do not grant trust by itself. Having a good reputation is like a risk protection for the partners reflecting that an individual is trust worthy, and it lays out a foundation for trust building (CM/GC).

- *Self-formed integrated team facilitates establishment of initial level of trust (CM/GC)*
- *Mutual respect and information sharing comes in advance of trust*

Indication of mutual respect comes in advance of trust. For instance mutual respects occur when a CM/GC engages the design team and incorporates their input once developing a schedule or cost, or when an Architect solicits input from a CM/GC to design to the budget (CM/GC).

6.6.3 Factors Promoting Trust

In "PROJECT ONE", there has been no event or action that diminishes trust; because of the leadership and the philosophy that was championed early on in the project, the team collaboratively got engaged in open dialogue around the problems and get them resolved. This is unique to IPD; usually in a traditional setting people do not feel comfortable discussing about the problem they have caused (CM/GC).

The IPD Team correlates the growth of trust to the following influential factors (Table 6-16). Further description on each factor is provided below.

Table 6-16: Influential factors promoting trust according to the IPD Core Team in "PROJECT ONE"

Influential element type	Trust	Factors promoting trust	Mentioned by
Contract	System-based trust	IPD principles enforced in the IPD agreement	CM/GC, PM
		Team building exercise	PM
		Shared risks and rewards	CM/GC
		Jointly developed project criteria and alignment of goals	Owner , Architect
		Collective authority	Owner, CM/GC
		Collaborative decision making	Owner, PM, Architect

Project participants	Cognition-based trust	Regular meeting, Continuous interaction	PM
		Leadership	PM
		Open dialogue	Owner, PM, CM/GC
		Mutual respect and information sharing	PM, CM/GC
		Discussion on how to collaborate	Architect
		Prior relationship & outside work relationship	Architect
		Early wins	Owner

6.6.3.1 **Contract**

- *Core principles of IPD enforced in the agreement*

The vision behind IPD is to create a highly collaborative environment where individuals trust each other, believing that they all would be performing their tasks in the best of their abilities. Thus there would not be continuous questioning of each other or the adversarial culture of finger pointing (PM).

IPD legally mandates individuals to act in good faith. In IPD setting, individuals are contractually obligated to do business the right way, be a good person, and help each other to succeed. That in itself promotes trust and collaboration (CM/GC).

- *Team building exercise*

The team arranged some team building exercise which has been effective in promoting trust and collaboration (PM).

- *Shared risks/rewards: one wins all win, one fails all fail*

The underlying concept of IPD is shared risks and rewards. In IPD either everyone wins or all fail. Thus the IPD contract encourages collaboration. Comparatively, in a traditional environment, often time individual trades are protected by their contract; they know they are safe as long as they perform their own business correctly. As a result, they usually do not make initiative to support other trades not to fail or to help them succeed, as they are neither contractually bound to them, nor have incentives to do so (CM/GC).

- *Jointly Developed Project Criteria and Alignment of goals*

Alignment of goals promotes collaboration and trust. At the onset of the project, the team got together and talked about the undertaking project, and verified that they all have agreed to utilize IPD approach

and that the project would most likely take four years to complete. Throughout a series of meetings and discussions, the team then discussed: 1. Their approach on how they would work together; 2. Their individual goals; And 3. The goal/vision of the project.

Building trust and working collaboratively is a work in progress. These discussions have continued to take place throughout the project to keep the parties in a same page. The team occasionally reminds each other of their goals, and expectations on how to work with each other (Architect, Owner).

- *Collective authority*

An agreement can foster achieving project success through empowering the team with decision making authority and aligning the team's project goals and vision (Owner, CM/GC).

- *Collaborative decision making*

In "PROJECT ONE", there is a weekly core team meeting. The meeting is run based on collective authority and collaborative decision making. Each member of the Core Team caries one vote and the discussions are frank and pointed. Each member is free to raise concerns or to speak their mind with respect to the whole working of the construction project. In an IPD setting everybody is working towards the same goal, and that is highly beneficial in promoting trust.

Comparatively, in a typical traditional project, the Owner caries all the power, and it is up to the Owner to manage the process. The Engineer works for the Architect and the Contractor works for the Owner. In an IPD arrangement, everyone is aligned and incentivized to collaborate towards the success of the project (Owner, PM, Architect).

6.6.3.2 **Project Participants**

- *Regular meeting, continuous interaction*

Following the core philosophy of IPD as part of the leadership strategy the team has had regular meetings (PM).

- *Leadership*

Leadership driven by the owner is a key to the success of IPD approach. In PROJECT ONE, the project management company, assisted owner with this leadership (PM).

- *Open dialogue*

In IPD, if there is an issue, there would be open dialogue to resolve it. This is unique to IPD; usually in a traditional setting people do not feel comfortable discussing about the problem they have caused (PM, Owner, CM/GC).

- *Mutual respect/ Information sharing*

Mutual respect and information sharing are huge trust building elements. Sharing ideas and asking each other's opinion on a subject reflects mutual respect, increases participants' sense of belonging to the project, and promotes trust. As an example, in "PROJECT ONE", there have been several occasions that an IPD member had to present the project in front of the board; before the meeting the individual in charge had called everyone in the project for a meeting to make sure that everyone is in agreement with what he/she is going to present. According to the team that was a great influential factor in building trust (CM/GC, PM).

- *Discussion on how to collaborate*

Discussion on goal/vision setting and strategies on how to work collaboratively could also take place in a traditional delivery approach. However, in "PROJECT ONE", the team did a better job in actually implementing those goals and objectives. The team made substantial efforts above and beyond the sessions, and had a regular dialogue about how they work together and what the goals are. The fact that the Owner wants the team to pursue an IPD/collaborative approach inspires the team even more to work differently and more collaboratively (Architect).

- *Prior relationship and also outside work relationship is effective in building and promoting trust*

Individuals who know each other from the past could make a better judgment of each other's ability, level of reliability, and trustworthiness. As a result, their expectations of their partners more accurately correspond with their partners' actual capabilities.

Trust is built and promoted once expectations are met or exceeded. It is argued that in projects where individuals know each other, it is easier for them to build trust at the beginning of the project and also trust is more likely to be promoted throughout the process as there would be fewer surprises (CM/GC).

Having outside work relationship and collaboration would promote trust. As an example, representatives from the CM/GC, the Project Manager, and the Architect presented "PROJECT ONE" at the Lean Conference. According to them, they have found the experience a good opportunity to step back from the

project, assess where they have been, and collaborate on something outside the project. Such an experience builds further relationship among the partners (Architect).

- *Leadership*

Leadership driven by the Owner is a key to the success of the IPD approach. In "PROJECT ONE", the Owner hired the Project Manager to provide this leadership on behalf of the Owner (PM).

- *Early wins*

In the establishment of the GMP, the team works hard together to come up with the way to achieve the outcomes and stay within the GMP. The team was successful in achieving that and it has been a good win for everybody. Once the team has experienced success together, they realize that they could work through problems together and overcome obstacles one more time. That winning spirit would in turn bring more success. Thus, if at the onset of the project, there are few decisions that go the right way, then it makes it easier to build more trust (Owner).

6.6.4 **Factors Promoting Participants' Sense of Belonging to the Project**

One of the trust-building attributes is creating a sense of belonging to the project. Any condition that positively influences and cultivates a sense of belonging to the common project promotes trust. Table 6-17 exhibits the influential factors promoting participants' sense of belonging to the project. Further description of each factor is provided below.

Table 6-17: Influential factors promoting participants' sense of belonging to the project according to the IPD Core team in "PROJECT ONE"

Influential factors promoting participants' sense of belonging to the project	Mentioned by
Team alignment in solving a common problem	Architect, CM/GC
Project with civic pride: the uniqueness of IPD model	Owner, CM/GC
The team members' buying in to the community	Owner, CM/GC
The sustained level of excitement and enthusiasm on behalf of the owner for the project	CM/GC
Collaborative decision making for the project	CM/GC
Team with the mindset of ensuring project success	Architect
Team building	PM
The Ten Commandments	PM
Follow up meetings to assess team's behavior	PM
Having outside work relationship	Architect

6.6.4.1 Team alignment in solving a common problem

Team collaboration and their alignment in solving a common challenge promotes individual's sense of belonging to the project. The team was asked to participate on behalf of the owner on several community events to speak about the project and promote the project. According to the team their involvement in presenting and promoting the project to the community promoted the team's sense of belonging to the project (CM/GC).

Furthermore, there were a couple of instances where the owner made some changes and the team had to collaboratively solve the issue; that experience promoted the team's sense of belonging to the project and built trust (Architect).

6.6.4.2 Project with civic pride: the uniqueness of the IPD model

A project that has civic pride in it promotes participants' commitment to the project. The uniqueness of the IPD model and the opportunity to try it in a large health care project as one of the first IPD implementers in the industry promotes the project participants' pride and sense belonging to the project (CM/GC, Owner).

The CM/GC, the Architect, and the Engineer were excited to be involved in a large project where they can test the new IPD model and be among the first implementers of IPD in the industry. They aspired to make the project and the model successful and promote their companies' reputation.

6.6.4.3 The team members' buying in to the community

A physical distance of the project participants' home offices from the project site is another factor influencing the project participant's sense of belonging to the project as sometimes commitment to a particular project is heavily vested in buying to a community. The project participants who are from the community where the project is built often have a deeper level of enthusiasm and ownership towards the project (CM/GC).

Even though the project participants in "PROJECT ONE" live far away from that community they feel strongly about the project and the community because Western Kentucky where the project is located is a relatively small community and has a friendly and open culture. Project participants who move in for this project automatically feel as part of the community, and that plays a role in fostering the participants sense of belonging to the project (Owner).

6.6.4.4 The sustained level of excitement and enthusiasm on behalf of the Owner for the project

The sustained level of excitement and enthusiasm on behalf of the Owner for the project is a key factor in building team around the project goals (CM/GC).

6.6.4.5 Collaborative decision making for the project

Collaborative decision making for the project fosters participant's sense of belonging to the project. IPD/ IFOA agreements lay out the frameworks and guidelines of the overall process and key goals and expectations. These agreements do not define and resolve every aspect of the deal in detail and often times leave certain issues to the core team's decision. This flexibility of the contract and the necessity of team working together in ruling out the process detail promotes team unity and sense of belonging to the project.

Comparatively, a contract that tries to anticipate every issue tends to be very rigid and somewhat convoluted (CM/GC).

6.6.4.6 Team with the mindset of ensuring project success

Team selection is a key to a collaborative process and a project success. The "PROJECT ONE" Owner has done a great job in selecting the right team partners for the project. The team members are a series of individuals who by nature are collaborative and the right candidates for an IPD project. The team mindset of ensuring the project success is a key influential factor in promoting the project participants'

sense of belonging to the project and its success. If team members had silo mentality, and were individual oriented that would have led to a non-collaborative process (Architect).

6.6.4.7 **Team building exercises**

Team building promotes participants' sense of belonging to the project. The team had several team building exercises during the project initiation phase and established the expectation of each party (PM).

6.6.4.8 **Establishing the Ten Commandments**

The team early on established Ten Commandments on how they are going to behave and act as a team. That fosters the team's sense of belonging to the project (PM).

6.6.4.9 **Follow up meetings to assess team's behavior**

The team has had subsequent follow up team meetings quarterly to assess each other's behavior in meeting the behavioral expectations as set in the Ten Commandments. These meetings are less about the project and more about how the team is working together, and treat one another. The follow up meeting mitigate and resolve any issue that may cause stress and diminish trust.

Comparatively, in a traditional delivery process, there may be similar type meetings such as partnering sessions, and meetings on expectation setting. However, according to the IPD team in "PROJECT ONE", the Ten Commandments, and the follow up meetings has proved to be more effective than the partnering session of the traditional delivery process, and that is mainly due to the leadership and the core IPD philosophy championed early on in the process (PM).

6.6.4.10 **Having outside work relationship**

Having outside work relationship and collaboration would promote trust. As an example, representatives from the /GC, the PM, and the Architect presented the PROJECT ONE in a Conference. According to them, they have found experience as a good opportunity to step back from the project, assess where they have been, and collaborate on something outside the building. Such an experience builds further relationship among the partners (Architect).

6.6.5 **Conclusion: Influential Factors Leading to Trust-based Relationships**

The influential factors leading to trust-based relationships are the combinatorial results of the prior charts on influential factors leading to the establishment of trust, development of trust, and promotion of sense of belonging.

Table 6-18: Influential factors leading to trust-based relationships according to the IPD Core Team in "PROJECT ONE"

Influential element type	Trust	Factors leading to trust-based relationship	Mentioned by
Contract	System-based trust	IPD principles enforced in the IPD agreement	CM/GC, PM
		Team building exercise	PM
		Shared risks and rewards	CM/GC
		Strategies to promote alignment of the team in solving a common problem	Architect, CM/GC
		Jointly developed project criteria and alignment of goals	Owner, Architect
		Collective authority	Owner, CM/GC
		Collaborative decision making	Owner, PM, Architect, CM/GC
Project participants	Cognition-based trust	Regular meeting, Continuous interaction	PM
		Leadership/ The sustained level of excitement and enthusiasm on behalf of the owner for the project	CM/GC
		Open dialogue	Owner, PM, CM/GC
		Mutual respect and information sharing	PM, CM/GC
		Self-formed integrated team	CM/GC
		Discussion on how to collaborate	Architect
		Prior relationship & outside work relationship	Architect
		Participants' good reputation	CM/GC
		Team with the mindset of ensuring project success	Architect
		Continuous assessment of participants' performance, Early wins	Owner, PM
Project		Project with civic pride: the uniqueness of IPD model	CM/GC

As shown in the above table, many of the influential factors promoting trust-based relationships are the elements that can be enforced through a contract. These contractual elements have a positive impact on developing system-based trust.

It is concluded that the IPD contract plays a key role in promoting collaboration. Continuous interaction, IPD principles enforced through the contract, shared risks and rewards, jointly developed project criteria

and alignment of goals, collective authority, and collaborative decision making are the elements of the contract that promotes trust and fosters collaboration among the team.

As shown in the above table, both contract and participants' characteristics impact trust-based relationship. In addition to these two elements, according to the IPD team, project complexity also encourages collaboration. Usually the more difficult and complex a project is, the parties find themselves more collaborative because they realize that they need each other's help in order to succeed and survive.

1) Contract
2) Project participants characteristics
3) Degree of project complexity

In "PROJECT ONE", the contract sets the ground rules and expectation of the Owner on how the team is going to work together, inspire to be more lean and efficient. However, it did not have significant influence on day to day activities and how the team would actually work together in a daily basis.

The day to day strategies on how the team would meet the objectives are not defined in the contract and are left to the team to work out strategies that best fits them.

In "PROJECT ONE", the team has achieved a certain degree of success which according to the Architect is mainly attributed to the talented and collaborative team rather than the contract.

6.7 Assessment of Trust

Trust is measured through both direct questions assessing trust, and also indirect questions assessing trust-building attributes.

6.7.1 Direct Questions Measuring Individuals' Perceptions of Trust

First, the IPD participants were asked to discuss if trust-based relationships were established among the participants at the onset of the project. Then, they were asked to evaluate how the level of perceived trust has changed throughout the project, and to foresee how the level of trust will be changed towards the project completion. Table 6-19 exhibits the participants perception of trust in the project.

At the onset of the project there was a basic level of trust; however, the trust has grown extensively as the project progresses. Right at the beginning of the project, everybody had a common mission; and that was to implement IPD. They were willing to try this new approach and see the result. They all believed in the spirit of IPD, they were all aligned on what they are trying to achieve. As a result parties come to the project less guarded than they often would in a traditional delivery process.

As the project starts, trust has grown very quickly much faster than in a traditional delivery process because everyone was aligned, respected the principles of IPD, and wanted to make it work (PM).

The team developed a trust-based relationship during the project initiation phase. However, verified trust was not fully formed until the real work and the discussion around drawing, schedule, and budget began. According to the Architect, at this point of the project trust perception toward other team members has been tested and verified (Architect).

The degree of trust varied among the parties. At the onset of the project there was a reasonable trust and collaboration between the Architect, the CM/GC and the Engineer, and to a lesser extent with the Owner as the Owner was not fully present at the onset of the project.

During the course of the project there was a change on the Owner's staff. The primary representative of the Owner left the project midway, and the position had been vacated for twenty months until it was filled. Thus, there was a substantial period where the Owner had no representative in the project. Prior to this change, the Owner acted more in a traditional manner, and it was not until this transition happened that the IPD got fully implemented.

Overall, trust has grown among the parties throughout the project. However the degree of trust growth is varied. Trust growth among those who did not know each other from the past is greater than the trust growth among those who has had prior experience together. For example, the Architect team had not worked previously with this particular CM/GC team or with the Engineer. The CM/GC and the Engineer had worked previously together, and thus that prior relationship has colored their perception of each other. The team is positive that trust will continue to grow throughout the project.

Table 6-19: Assessment of trust throughout the project

Changes in the level of trust as project progresses	Owner	CM/GC	Architect	Project Manager
Presence of trust-based relationships among participants	Yes	Yes	Yes	Yes
Changes in the perceived level of trust as project progressed	Increased	Increased	Increased	Increased
Forecast of how it will change	Increase	Increase	Increase	Increase

6.7.2 Indirect Questions Measuring Trust-Building Attributes

Level of trust was also measured through a series of indirect questions assessing the perceived level of trust-building attributes in the project. A series of multiple choice questions were developed based on the trust-building attributes framework (Table 5-1). From the scale of 1 (minimum level of trust) to 5 (maximum level of trust), the key IPD participants were asked to assess the perceived level of trust-building attributes in the project. For each trust-building attribute the mean is calculated, and a bar chart is developed accordingly (Figure 6-5).

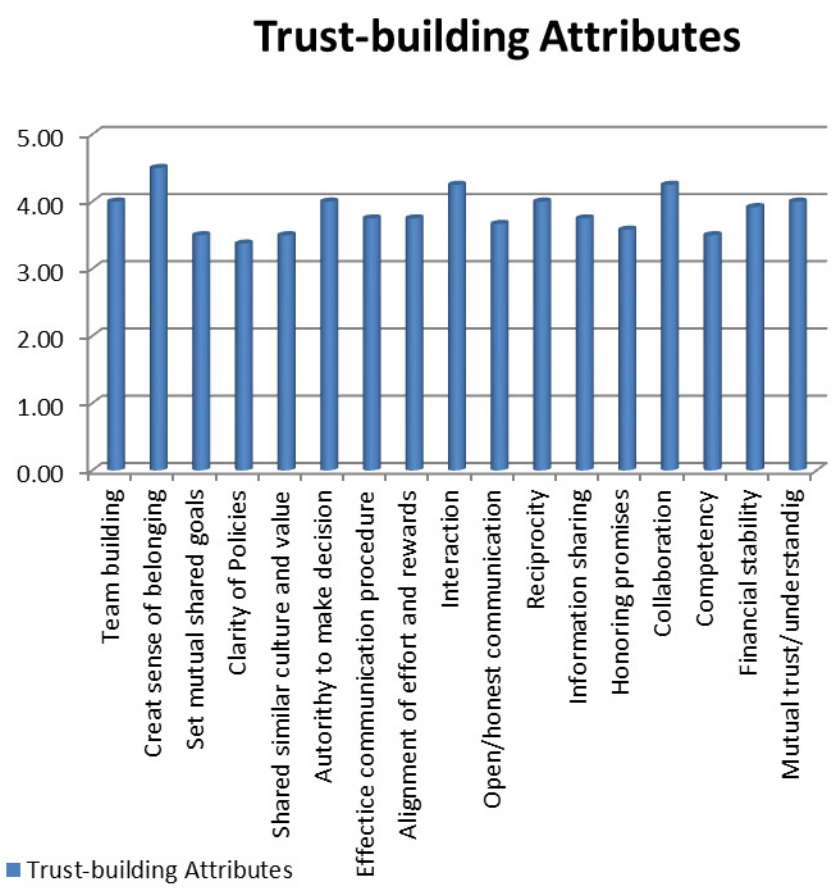

Figure 6-5: Assessment of trust through trust-building attributes

- *Team building activity*

As part of the team building activity, the Owner arranged a day long goal/vision session at the onset of the project (Architect). Furthermore, early on in the project once the team members were selected, the team decided to spend a day to get together and discussed everyone's expectation for each other (Owner).

The team laid out Ten Commandments of IPD, and went over the do's don't for the team. That was a great step to get the communication flowing. Additionally, the Core Team had a retreat in Colorado. The Core Team took two days and went to Colorado to discuss the project issues. The team built in some activity time and went fishing together. All these activities helped in building relationships and led to a more united team. The owner did not attend these team building activities (CM/GC).

Overall, according to the team, compared to traditional delivery approach, IPD has more contribution on team building and thus promotes trust.

- *Create sense of belonging*

IPD has a positive impact on creating and fostering sense of belonging.

- *Set mutual shared goals*

The overriding goal of the CM/GC, the Architect, and the Engineer even in an IPD setting is business, thus profitability and reputation. The overriding goal for the Owner, however, is to build quality building in which they could take care of patients. To the owner, financial profitability is secondary. The goals of the parties are aligned but the priorities may be different (Owner).

- *Clarity of contract*

The IFOA or IPD agreement does not usually address details about the process. The guideline, project goals and expectations are outlined at a macro level, and the details on the day to day activities in dealing with issues are left to the IPD Core Team. For example, the language for change, compensation, and time are not that specific and many times refer judgment to the Owner and Core Team (CM/GC).

Currently, the project is at the steel erection phase; simultaneously drawings of other parts of the building are still being issued. At this stage, there has not been any major issue concerning the contract clarity. The contract appears to be clear, and any minor issue has been easily resolved by the *Core Team*.

For example, the only confusion the team has faced relates to the professional liability insurance policy carried by the Owner. IPD is a new process, and a new contract. It takes time for the parties to become familiar with the process and understand the differences.

The team was anticipating that if there is a professional liability issue, such as errors and omission, and as a result a claim filed against that policy, such a claim would be looked at and paid immediately. However, the insurance company came with an exclusionary endorsement stating that the insurance company would only take a claim if the entire project contingency is exhausted.

The IPD Core Team was able to work on the issue quickly without any interruption to the work. The team attitude can be attributed to the leadership, the core IPD philosophy in place, and the team's integrity. The team trusts each other and knew that together they could overcome any challenge. The issue has been resolved for the most part and the team is optimistic that it will be soon resolved completely (PM).

Furthermore, it is of paramount importance that the contract clearly and specifically defines the project goals. IPD contracts encourage contracting parties to act in the best interest of the project. What is best

for the project may be very subjective and defined differently by individuals. Thus, it is important that the contract clearly and specifically defines what is best for the project, for example in terms of cost, schedule, architecture, energy efficiency, etc. If the owner is general about the goal of the project, then there is more possibility that the individual team members elect what those goals might be. In "PROJECT ONE", the owner was relatively specific about the project goals; they provided a budget cap, and the space requirements (CM/GC).

- *Building similar culture and value*

The team conducted several goal and process sessions, and also team building activity.

- *Collective decision making*

According to the IPD team, decisions are made collectively by the representative of each IPD participants within the boundaries created by the board and the Owner Executive Team. Compared to a traditional model, the Architect, the CM/GC, and the Project Manager have more authority/ more involved, while the Owner has less authority/as involved (SOURCE).

- *Effective communication procedure*

The team has used the following communication tools: Email, phone, Building Information Modeling, meetings, and webex.

- *Shared risks/rewards*

Participants agree that the contract is fair and the risks are evenly shared by the parties.

- *Dispute resolution*

The team has experienced several disagreements among its members on several design and timing related issues. There was a fairly minor misunderstanding regarding scope, quality, early budget inclusions/exclusions which resolved quickly. However, the Core Team has been successful in continuously resolving the issues without having to refer to any dispute resolution process (Owner).

- *Alignment of efforts and rewards*

Incentives were not defined at the time of the contract and little attention was paid to the design phase deliverables (CM/GC).

- *Interaction among the team*

The team interacts regularly and through various type meetings. The meetings are as follow: OAC meetings (weekly), budget conference call between the Architect & the CM/GC (weekly), coordination meetings between the Architect & the Engineer (weekly), design integration meetings (once a month), Core Team meetings (weekly), senior management group meetings (once a month), and steering committee meetings (once a month).

The design integration meeting are a day long integration session where the Engineer, the CM, and the Architect get together to maintain a shared understanding of the project scope, budget, design, and to accomplish the best coordinated project.

Core Team meetings include representatives from the Architect, the Engineer, the Owner, the Project Manager, and the CM/GC. They meet weekly and also have a daily interaction. One of the Core Team meetings in the month is more dedicated to how the team is functioning: the team dynamic and behavior.

The Senior Management group includes the senior leadership individuals representing the Architect, the Engineer, the Owner, the Project Manager, and the CM/GC. These meetings occur once a month to discuss issues that the core team may have not been able to address.

The Steering Committee includes all members of the Core Team and also the hospital executive teams. They meet once a month.

Throughout design and construction the CM/GC and the Design team have been in constant communication with each other. They have had daily interaction through email and phone, and meet at least every two weeks person to person on several occasions such as coordination meeting, scheduling session, and budgeting session. The design and construction teams have had regular meetings with the Owner.

Contractor- subcontractor meetings: the CM/GC meets with the Subcontractors three times a week on different subjects: 1. Lean meeting; 2. BIM session; and 3. Coordination meeting with all the site contractors. There is also a pull session every four weeks in which everyone participates.

The team in “PROJECT ONE” argues that there is a higher level of interaction and communication among the team in this project compared to other traditional projects they have been involved with in the past. Individuals in this project take responsibility and ownership of the project and aspire to find and solve potential problems before they are presented.

- *Open/honest communication*

Compared to a traditional delivery approach, IPD is more effective in promoting open information sharing.

- *Reciprocity*

The IPD Core Team mark the following as the influential factors impacting reciprocity behavior: individual characteristics of the participants, shared risks and rewards provision, and contract requirements and expectations set in place (IPD Core Team).

- *Collaboration*

The IPD contract is highly effective in promoting collaboration. What may make it less effective is the characteristics and personalities of the people representing the members (Owner).

- *Team's familiarity with each other*

The Architect did not have prior experience with any of the project stakeholders; the Project Manager only knew the Engineer; the Owner knew the CM/GC, the Engineer, and the Project Manager; the CM/GC only knew the Engineer and the design assist subcontractors.

None of the design-assist subcontractors, such as mechanical, electrical, fire protection, envelope and drywall have had prior experience with IPD.

The unfamiliarity of the team with each other, and with the IPD approach poses some challenges to the team at the onset of the project. The scope development phase provided the team with some time to become familiar with each other and to see if they are able to trust each other and get into an IPD agreement. During that initial phase, the team also became more educated on IPD and realized the potential benefit of implementing this approach. Finally, they decided to implement the IPD contract (CM/GC).

6.8 IPD Approach and Trust-based Relationship

This section demonstrates if/how trust-based relationships and IPD contract correlates. Through an open ended question individuals were asked to reflect on the correlation of IPD approach and trust-based relationships. Furthermore, the interview questionnaire also includes a series of multiple choice questions which examine the relative effectiveness of IPD versus a traditional delivery approach on trust-building attributes. There are three choices: 1. Less effective, 2. Same, 3. More effective. For the demonstration purpose, an assumption is made to give the effectiveness level of traditional delivery approach on trust-building attributes, level three. Less effective influence is illustrated in level one, and more effective influence is illustrated in level five. The mean of participants' responses were calculated, and a bar chart developed correspondingly to schematically demonstrate the relative effectiveness of IPD approach versus a traditional delivery approach on trust-building attributes **Error! Reference source not found.**. The red dotted line represents the effectiveness of traditional delivery approach on trust-building attributes, and the blue bars represent the effectiveness of IPD approach on trust-building attributes.

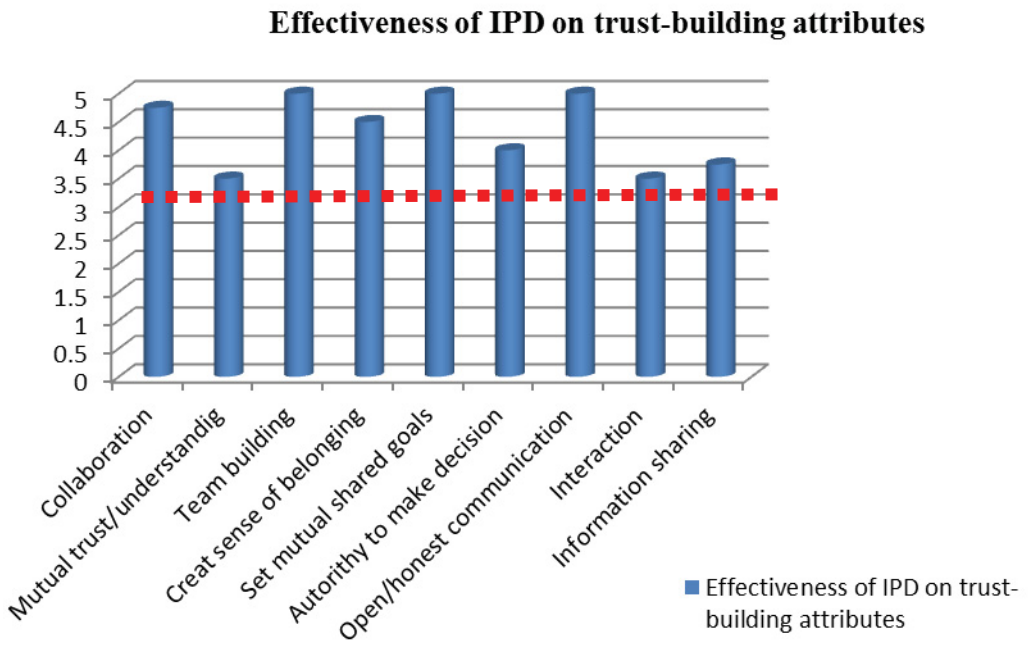

Figure 6-6: Comparative effectiveness of IPD versus a traditional delivery approach on trust-building attributes in "PROJECT ONE"

The following sections provide further insight into the IPD participants beliefs on how IPD is more effective in promoting trust-based relationships relative to a traditional delivery approach.

- *Committing to an IPD agreement requires an initial level of trust*

Individuals can commit to an Integrated Project Delivery agreement and plan for success only if they can establish an initial level of trust with each other. This initial level of trust can be based on gut feeling, prior experience, etc.

Individuals who are highly doubtful would take actions that not only will increase trust but will diminish trust. In "PROJECT ONE", the CM/GC, the ARCHITECT, and the ENGINEER were able to develop and establish an initial level of trust among themselves before they formally committed to the IPD agreement (CM/GC).

Trust is an attitude. It is something that is earned, and thus it requires time to be built. People must break down barriers internally before they start a project. Considering that trust has a time dimension built into it, for an IPD project to be implemented, it requires that either: 1. Parties know each other and have already established trust between them through past experiences, or 2. They need a phase where they could get to know each other, evaluate each other's behavior, and measure the level of trust, or gradually build trust before they can decide if they feel comfortable to get into an IPD project.

A lot of people go into a situation immediately distrusting someone until they earn that trust. In IPD individuals enter the project with an assumption that they can trust each other, until they are proved otherwise. That may sound easy but difficult in reality. If individuals go into a project with such trusting mentality, they are going to start on the right foot (PM).

IPD agreement can be signed in two phases of the trust-building life cycle: 1. Once individuals have been able to develop an initial un-verified trust; 2. Once the initial trust is tested and verified. Obviously, phase two puts parties in a more comfortable position to commit to the IPD agreement and share risks and rewards as individuals have more confidence in each other's ability to make the project successful.

Usually when an IPD contract is signed, individuals only have initial trust among them which is highly dependent on their assumption of each other's trustworthiness. To a great extent, this trust is un-tested and unverified. The greatest obstacle towards signing the IPD contract is when parties cannot trust each other and are unable to establish the initial faith-based trust.

Thus, an IPD setting desires individuals, who are trustworthy and are able to initiate a trust-based relationship with their project partners. The IPD participants assume that they are all together in the project and no one would act in a bad faith to damage the business deal or opportunities. This initial type of trust is not very strong and is only a foundation for building trust.

A well-established contract outlines project goals, roles, responsibilities, liabilities, and communication process clearly. As project progresses, people continuously measure the level of trustworthiness of their partners against the benchmarks set in the contract. If evidence verifies the trust worthiness of their partners, their trust grows.

- *IPD contract is developed during project initiation phase*

Throughout the project initiation phase the team collaboratively performs pre-programming, pre-design, and master planning of the facility.

The IPD contract is developed during the project initiation phase and is signed at the end of this phase. It almost took the team a year to collaboratively develop the contract and make it ready to sign (Architect).

There were several reasons as why the contract was not signed sooner: 1. not all of the project partners were on board right at the onset of the project; e.g. the Project Manager came onboard after the team was working for 6-8 months. Before the Project Manager joined the project, the team did not have a clear definition of scope, and so there was not enough information for writing the contract. The Owner was not much prepared to push the contract forward. The Project Manager takes the leadership of the team and helps the owner and the team to define the project scope. Finally, in July 2009 the project scope was fully defined and the contract presents enough information to the parties to sign (Architect).

During the project initiation phase the team collaboratively defined the project, developed the project scope, schedule, budget, and discussed the guiding principles as how the team is going to behave and work together. Furthermore, during this phase the team would collaboratively develop the IPD agreement.

The project initiation phase offers time and opportunity for the parties to work together, evaluate each other's collaborative behavior, and build trust. Because the IPD contract requires parties to have an initial level of trust towards each other, this phase plays a key role in providing an opportunity to measure and/or build that initial level of trust. In the end, the owner and the project participants would have a more clear idea whether they are comfortable to commit or not to commit to the IPD agreement with the rest of the team. In essence, the project initiation phase resembles the dating/engagement period in a marriage.

- *Project initiation phase provides the opportunity for verifying faith-based trust*

One of the IPD principles is 'trust but verify.' While everyone in the project took advantage of this stage to test and verify the existing trust, the Architect believes that they had the most advantage. At the onset of the project the Architect who was new to the team was at the phase of 'trust but verify' stage. They inherently assumed they could trust others, however, they also wanted to make sure that they are not making a mistake doing so. During the project initiation phase, the Architect was able to build a fairly high degree of trust with the rest of the team (Architect).

If the owner had given an IPD contract right off the bat and said this is what we are going to sign, that totally would have gone against collaboration. In this project, the IPD contract is not signed early on; through the process the team work on the agreement together (PM).

The contract can be effective in promoting positive behavior. The IPD contract fosters collaboration, because the arrangement is structured in a way that if one wins all win, and if one fails all fail. Financial incentive ties individual success to the project success, and thus promotes collaboration (Owner).

Part of the challenge in "PROJECT ONE" was that the incentive provisions were not defined early enough to include the design phase as well. The incentive plan is more of construction incentives and does not incentivize the whole team equally (CM/GC).

According to the team, the incentives have had a positive impact on trust and collaboration. They argued that ever since the incentive plan has been put in place the team thinks differently, and there is a better dialogue among the team around project issues and how to manage contingency. They believe that if the incentives had put in place earlier during the design phase the Owner could have gained more out of the project through an enhanced involvement from the design assist subcontractors, such as mechanical, electrical, and plumbing (Architect).

For an incentive plan to be most viable and effective, it should involve all parties and all phases. The owner should focus on the project goals and priorities to build the incentive plan around them. An incentive plan that is set early in the process and incentivizes the whole team equally fosters collaboration and cooperation among the team (CM/GC).

There are various incentives for the project participants to collaborate with each other and make the project successful: 1. The pride for the team to successfully deliver the second largest hospital project in the nation; 2. The pride of being among one of the first implementers of the innovative IPD delivery

approach; 3. The IPD contract ties individuals success to the project success, and as a result incentivizes the team to collaborate; 4. There are a couple monetary incentive provisions.

"PROJECT ONE" is the second largest IPD contract health care in the United States after a Hospital called Cathedral Hill in San Francisco. Thus for the project participants it is a pride to be involved and to successfully be delivering such a large project.

IPD is new. It is developed in response to the current challenges associated with the current traditional delivery approach. IPD is meant to integrate the team, break silos, and foster communication, flow of information, and collaboration among different professions. People who currently get into an IPD setting are usually individuals who are tired of dealing with issues and disputes in a traditional delivery setting and believe in the IPD principles and the differences they could make. Thus in "PROJECT ONE", project participants began the project with an aspiration to do business differently, be more collaborative, and deliver an extraordinary results to show the industry how IPD is a better way of doing business (PM).

While the IPD projects by nature are conducted in a more collaborative manner, it does not mean that we cannot see the same level of collaboration on a conventional delivery process. Collaboration refers to individual characteristics. Collaborative projects have a collaborative team, and a collaborative team is made of good individuals with collaborative spirit. For such people the contract is not the reason why they behave in a collaborative manner; they exceed their roles and responsibilities as set by the contract. What differentiates an IPD/ IFOA agreement from a conventional delivery contract is that the IPD contract actually mandates a collaborative behavior (CM/GC).

Compared to a more conventional type of delivery approach, IPD agreement is more effective in promoting trust and collaboration (IPD Team). In addition to the role of contract in establishing and promoting trust, partners individual characteristics, experience & competency, and their commitment to the project success would also have a fundamental influence on the level of collaboration and building trust-based relationships (Architect).

CHAPTER 7 CASE STUDY TWO

The following case study is the analysis result of the information gathered through the General Conditions of the Contracts for Design and Construction, Integrated Project Delivery Agreements between the Owners, the Architect, and the General Contractor (GC), Design Service Agreements between the Owners and the Architect, Construction Service Agreements between the Owners and the GC, and also individual one-on-one interviews with the IPD Core Team members including representatives of the two Owners, the Architect, and the GC.

The interview with the Owner A was conducted at the project site. Interviews with the Owner B, the GC, and the Architect, were conducted at their individual offices.

The overriding objectives of developing the following case study are: 1. To provide a real world example of an IPD project as a learning toolkit on the subject of Integrated Project Delivery (IPD) concept and the associated new terminologies; 2. To highlight the comparison results of IPD and traditional delivery approach through the "PROJECT TWO" example; 3. To demonstrate how trust-based relationships are built and promoted throughout a project, and 4. To identify the correlation of IPD contracting strategies and trust-based relationships and to examine the comparative effectiveness of IPD versus a traditional delivery approach on trust.

Based on the literature review and the contract documents, a questionnaire was developed including both open-ended and multiple-choice questions. The interviews were audio recorded, transcribed, analyzed, compared, combined, coded, and categorized under the emerging themes and titles.

The information on the following case study is organized into four sections: A. Introduction to the project; B. The project delivery and contracting approach including the IPD features; C. Comparative analysis of IPD and a traditional delivery approach; D. Trust-development process; E. Trust measurement; F. Correlation of IPD approach and trust-based relationships.

1) Introduction to "PROJECT TWO"

The information regarding project scope, schedule, and cost is taken from the contract documents.

2) The project delivery and contracting approach including the IPD features

The project delivery and contracting strategy (PDCS) framework, which was developed through literature review analysis, is used as a framework for presenting the case study information on the project delivery contracting approach implemented in the project. The contract documents and the result of the interviews are used to fill in the PDCS framework with the information on the case.

The IPD principles and characteristics table which was developed through literature review and analysis is utilized to examine the IPD features of the project.

3) Comparative analysis of IPD and a traditional delivery approach

Through an open-ended questionnaire, the key IPD players were asked to reflect on their experience with the IPD approach; and to discuss how the IPD has changed the way they used to carry out a similar project in a a traditional delivery setting; and how their responsibilities, liabilities, and risk exposure have changed in IPD. This section presents the combinatorial result of the interviews with the core IPD team members.

4) Trust-development process

The information in this section is the combinatorial results of the interviews with the core IPD team members. Through a series of open-ended questions participants are asked to define trust, discuss the parameters that are effective in establishing trust, promoting trust, and advancing participants' sense of belonging to the project. In the end, a table is developed that includes all the influential factors that result in building trust-based relationships. Based on the nature of the influential factors, conclusions are made to demonstrate if/how contracts or project participants are effective factors in establishing and building trust.

5) Trust assessment

The IPD Core Team members were asked to discuss their perceived level of trust towards each other at the onset of the project and how that initial level of trust has changed throughout the project. Furthermore, the trust-building attributes framework which was developed through the literature review and analysis are used to assess and measure trust in the project. The participants are asked to evaluate the trust-building attributes from the scale of 1 (indicating the minimum level of trust) to 5 (indicating the highest level of trust). For each trust-building attribute, the mean number of the participants' responses is calculated and a bar chart representing all trust-building attributes is developed accordingly to illustrate the level of trust in the project.

6) Correlation of IPD approach and trust-based relationships

This section demonstrates how trust-based relationships and IPD contract correlates. Through an open ended question individuals were asked to discuss the interrelationships of the two. Furthermore, they were asked to comparatively assess the level of effectiveness of the IPD approach versus a a traditional delivery approach on trust-building attributes.

7.1 Introduction to "PROJECT TWO"

This section includes key factual information about the project: 1. Scope summary, 2. Master program budget, 3. Project schedule, and 4. Value definition. Table 7-1 exhibits a summary of project information.

Table 7-1: "PROJECT TWO" information

PROJECT TWO	
Project	PROJECT TWO A new integrated medical campus (office, hospital, parking, etc.)
Project Location	Northwest of USA
Building Type	Integrated Medical Campus (hospital, a mixed use office building, surface and underground parking facilities, an ambulatory care center, a central utility plant and other improvements)
Gross SF	599,019 SF (Owner A Improvements: 350,646 SF + Owner B Improvements: 248,373 SF)
Owners	Two Owners (Owner A & Owner B)
Project Time Frame	February 2009- December 2011
Form of Agreement	Multiple two-party agreements + An IPD agreement (signed by owners, contractor, architect, project manager)
IPD Players (Core Group)	• Two Owners: Owner A & Owner B • Architect • Contractor • Project Manager (non-voting member)
Key Dates	Preliminary Design: February- December, 2009 Construction: January 2010- September 2011
Cost	Construction cost: $205,637,259 (Owner A Improvements: $170,786,133.00 + Owner B Improvements: $34,851,126.00)

7.1.1 Scope Summary

"The project Owners, Owner A and Owner B , are concurrently developing an integrated campus, which shall consist of the MOB, the ACC, the Hospital, the Central Plant and the Site Improvements, all as defined, with the MOB located on the MOB Parcel ("Owner B Improvements") and the ACC, the Hospital, the Tenant Improvements, the Central Plant and the Site Improvements located on the Owner A's Parcel ("Owner A Improvements")" (Owner A-Contractor Construction Agreement, 2010, p.2).

"Owner A is the owner of certain real property located in King County, Washington upon which it intends to develop an integrated campus consisting of a hospital, a mixed use office building, surface and underground parking facilities, an ambulatory care center, a central utility plant and other improvements (all of the foregoing shall be collectively known as the "PROJECT TWO")" (IPD Agreement, p.1).

Owner A Improvements

"Owner A is developing on the 'PROJECT TWO' a three (3)-story acute care hospital containing approximately Two Hundred Twenty-nine Thousand Seven Hundred Fifty three (229,753) gross square feet (the "Hospital"), a two (2)-story acute care center containing approximately One Hundred Fourteen Thousand Six Hundred Ninety-three (114,693) gross square feet (the "ACC"), a one (1)-story central power plant serving the Hospital and the ACC and containing approximately Sixteen Thousand Two Hundred (16,200) gross square feet, and associated infrastructure, parking areas, driveways, sidewalks, other vehicular and pedestrian access areas, landscaping and other common area improvements (the "Site Improvements") (the Hospital, ACC, Site Improvements and MOB/Atrium Tenant Improvements (defined below) are hereinafter collectively referred to as the "Owner A Improvements")" (IPD Agreement, p.1).

Owner B Improvements

"Owner B will concurrently develop and subsequently own the core and shell of a five (5) story mixed-use medical office building and diagnostic center, containing (i) approximately One Hundred Sixty-three Thousand Six Hundred Thirty-nine (163,639) gross square feet of office space (the "Office Space"); (ii) approximately Eight Thousand Six Hundred Thirteen (8,613) gross square feet of retail space (the "Retail Space"); (iii) an underground parking garage containing approximately Fifty Thousand Six Hundred Eightyeight (50,688) gross square feet and

approximately 125 parking spaces (the "Parking Garage"); and (iv) an atrium containing approximately Twenty-five Thousand Four Hundred Thirty-three (25,433) gross square feet (the "Atrium Space"), all in accordance with the Drawings and Specifications" (Owner A –Contractor Construction Agreement, 2010, p.4).

"Contractor will in most cases be using the same supervisory, administrative and support personnel and facilities in performing it obligations under both the Construction Agreement and the 'Owner B' Construction Contract. Contractor will also be placing one insurance policy to meet to the insurance requirements under both the Construction Agreement and the 'Owner B' Construction Contract" (Owner A -Contractor Construction Agreement, 2010, pp.5-6).

7.1.2 **Master Program Budget**

- *Construction GMP for Owner A Improvement*

"The total Cost of the Contractor's Work and Contractor's Fee is guaranteed by Contractor not to exceed the amount of one hundred seventy million seven hundred eighty-six thousand one hundred thirty-three and 0/100 Dollars ($170,786,133.00)" (Owner A -Contractor Construction Agreement, 2010) .

- *Construction GMP for Hamess Improvement*

"The total Cost of the Contractor's Work and Contractor's Fee is guaranteed by Contractor not to exceed the amount of Thirty-four Million Eight Hundred Fifty-One Thousand One Hundred Twenty-Six and 00/100 Dollars ($34,851,126.00)" (Owner B-Contractor Construction Agreement, 2010).

"Based on the Construction GMP established under this Construction Agreement and the Construction GMP established under the 'Owner B' Construction Contract (the "Owner B GMP"), Owner, Contractor and Owner B (PM) agree that Owner shall be allocated and responsible for paying 83.05% (the "Owner Share") of the Costs of the Contractor's Work associated with Contractor Campus Wide Costs under this Construction Agreement and that Owner B shall be allocated and responsible for the other 16.95% (the "Owner B's Share") of the Costs of the Contractor's Work associated with Contractor Campus Wide Costs under the Owner B Construction Contract" (Owner A -Contractor Construction Agreement, 2010, pp.5-6).

7.1.3 **Project Schedule**

"The parties acknowledge and agree that Architect commenced performance of the Preliminary Design Services on or about February 2, 2009, completed the same on or about December 15, 2009, and commenced performance of the Final Design Services on or about December 15, 2009" (Owner A & Architect Design Agreement, 2010, p. 6).

"Substantial Completion of the Initial Work shall be achieved by on or before June 1, 2011 (the "Initial Work Target Substantial Completion Date"). Final Completion of the Initial Work shall be achieved on the later of ninety (90) days after Substantial Completion of the Initial Work, or ninety (90) days after delivery to Contractor of a punch list prepared by Architect and approved by Owner.

Substantial Completion of the Hospital Work shall be achieved by on or before December 1, 2011 (the "Hospital Target Substantial Completion Date"). Final Completion of the Hospital Work shall be achieved on the later of ninety (90) days after Substantial Completion of the Hospital Work, or ninety (90) days after delivery to Contractor of a punch list prepared by Architect and approved by Owner" (Owner A -Contractor Construction Agreement, 2010, p.10).

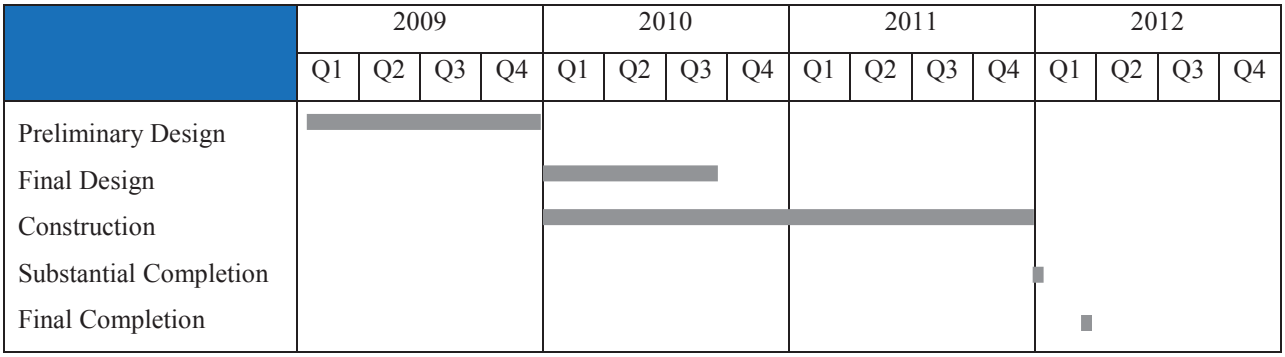

Figure 7-1: "PROJECT TWO" milestone schedule

7.1.4 **Value Definition**

The Owner's basic value proposition is to build the facilities for no more than the price set forth in the Construction Budget, within the time frame established by the Conceptual Schedule. In addition, the Owner believes that attaining that value proposition will be benefited by implementing Integrated Project Delivery (IPD) approach.

According to the Agreement for Integrated Project Delivery, "The Parties agree to form an IPD Team to facilitate design, construction and commissioning of the Project. The team members shall openly share information and cooperatively collaborate for the benefit of the Project. By forming an Integrated Team, the Parties intend to gain the benefit of an open and creative learning environment, where team members are encouraged to share ideas freely in an atmosphere of mutual respect and tolerance.

Team members shall work together and individually to achieve transparent and cooperative exchange of information in all matters relating to the Project and to share ideas for improving Project delivery. Team members shall actively promote harmony, collaboration and cooperation among all entities performing on the Project" (Owner A -Contractor Construction Agreement, 2010).

7.2 Macro Elements of Project Delivery and Contracting Strategy (PDCS)

The project delivery and contracting strategy framework, which was developed through literature review analysis, is used as a framework for presenting the project delivery contracting approach implemented in "PROJECT TWO". Figure 7-2 illustrates the Macro elements of PDCS in "PROJECT TWO".

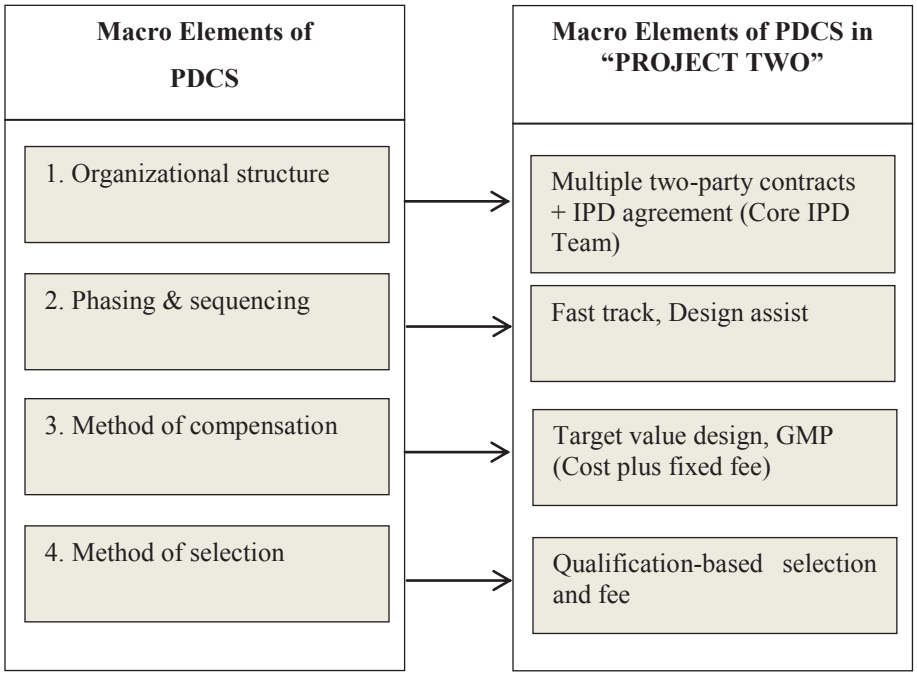

Figure 7-2: Macro elements of PDCS in "PROJECT TWO"

7.2.1 Organizational Structure: Multiple Two-Party Contracts plus an IPD Agreement

> "Owner A, Owner B, Contractor, Architect, and Project Manager desire to pursue an Integrated Project Delivery approach to the design and construction of the "PROJECT TWO" for the purpose of governing, among other things, the use and treatment of the Project Contingencies and 'at-risk' fees "(IPD Agreement, P.2).

IPD negotiation took almost a year to be completed. The idea of utilizing the IPD method initially was proposed by the GC who had been involved in a construction of a hospital project based on a tri-party IPD agreement. The GC prepared a draft IPD joining agreement and suggested to the team. The team then took the contract and sought their attorneys' advice. According to the GC, the attorneys'

involvement made the process longer up to the point that it took the team almost one year to come with the terms of the agreement (Contractor).

The GC, the project manager, the Architect, and the Owner collaboratively developed the agreement. The project manager took the lead, and outlined the framework, and then everybody else contributed to it (Architect).

The contract consists of multiple two-party contracts with a common contract agreement (IPD agreement) between the Owner, the Architect, and the GC. The contract documents include the following: 1. Two Owner-Architect agreements (One agreement for Owner A and one for Owner B), 2. Two Owner-Contractor agreements (One agreement for Owner A and one for Owner B), and 3. Common contract documents including: A. Integrated Project Delivery Agreement among the Owners, the Architect, the GC, and the Project Manager, B. MOB General Conditions of the Contracts for Design and Construction, C. Drawings, D. Specifications, E. The Construction Schedule, and F. Submittals (MOB General Conditions, p.1).

It is, however, important to note that in "PROJECT TWO" the decision to go with the IPD approach was made after virtually all the contracts have been executed between the Owners and the Architect, the Owners and the GC, and between the two Owners. So, the IPD agreement is a bridging document and is really considered an overlay on top of the existing two-party agreements to the extent that each of the parties has skin in the game (Owner/PM and Architect).

Owner team includes Owner A, and Owner B who also serves as a Project Manager.

> "Owner has engaged Project Manager under a separate contract to represent and advise Owner's in the administration and performance of this Construction Agreement" (Owner A -Contractor Construction Agreement, 2010, p.9).

> "Owner A and Owner B have retained Project Manager under separate project management agreements to manage the design, development and construction of the Project; Owner B has retained Architect to provide all design services necessary to design the 'Owner B' Improvements (the 'MOB Design Services Agreements'); and Owner A has also retained the Architect to provide all design services necessary to design the Owner A's Improvements and certain MOB/Atrium Tenant Improvements (the 'Owner A Improvements Design Services Agreement'); Owner A has also retained Callison Design, LLC ('Callison'), to provide all design services necessary to design the remaining MOB/Atrium Tenant Improvements pursuant to a Design

Services Agreements dated as of even date herewith; Owner B has retained Contractor to provide all construction services necessary to complete the Owner B Improvements (the 'MOB Construction Agreement'); and Owner A has also separately retained Contractor to provide all construction services necessary to complete the Owner A Improvements under a separate Construction Contract dated as of even date herewith (the 'Owner A Improvements Construction Agreement')" (IPD Agreement, p.2).

- *Core IPD Team*

  "Core IPD Team shall mean, collectively, project management representatives of Owner A, Owner B, Contractor, Architect and Project Manager" (IPD Agreement, p.3).

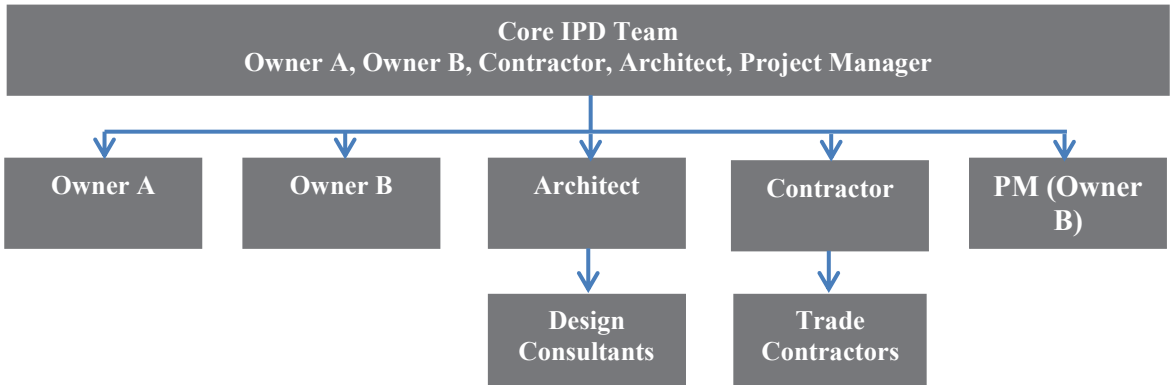

Figure 7-3: Core team organizational structure in "PROJECT TWO"

- *Project Executive Team*

  "Project Executive Team shall mean, collectively, Owner A's Senior Management Representative, Owner B's Senior Management Representative, Contractor's Senior Management Representative, Architect's Senior Management Representative and Project Manager's Senior Management Representative" (IPD Agreement, p.5).

- *Subcontracts*

Under the terms of IPD agreement, the GC has engaged two of the largest Mechanical and Electrical subcontractors early in the project design phase. The subs are not in the original IPD agreement, as they are in separate agreements. However, the GC's agreement with these key subs incorporates some of the incentives included in the IPD agreement (Owner/PM).

> "Key project participants shall be added to the IPD Team as agreed to by the Project Executive Team from time to time, such as separate contractors, subcontractors, consultants and suppliers critical to the definition and accomplishment of the Project and involve them at appropriate times for the benefit of the Project. Such participants shall be added to the IPD Team and become a party to this Agreement through the negotiation and execution of a Joining Agreement" (IPD Agreement, p.7, section 2.1.5).

> "By written agreement, Contractor shall require each Subcontractor, to the extent of the work to be performed by the Subcontractor, to be bound to Contractor by all the terms of Contract Documents, and to assume toward Contractor all the obligations and responsibilities which Contractor, by these Contract Documents, assumes toward Owner and Architect…Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractor" (MOB General Conditions, Section 6.3.1).

For some portions of the project , the Owner has required the Design/Build Subcontractors. It is agreed that the GC is not a designer and has not independently reviewed the details of the designs of the Design/Build Subcontractors. The Design/Build Subcontractors shall maintain a standard Professional Errors and Omission Insurance policy for a period of two years after the Substantial Completion of the Project (MOB General Conditions, p.23).

7.2.2 **Phasing & Sequencing: Fast track and Design Assist**

Owner A with the help of the Architect developed a conceptual master planning. The Request For Proposal (RFP) was sent out based on the conceptual master plan to select a General Contractor and also an Architect for proceeding and completing the design. The selected Architect further developed and completed the design efforts, and the General Contractor put a GMP together based on a 50% complete design drawings (Contractor).

"Contractor has been authorized to perform some early construction work for the Campus Development (the "Early Work")" (Owner A -Contractor Construction Agreement, 2010, p.2).

Under the terms of IPD agreement, the GC has engaged two of the largest Mechanical and Electrical subcontractors early in the project design phase (Owner/PM).

"Architect acknowledges that Owner desires Contractor to be a full participant with respect to the overall concept and functionality of the Project, and with respect to providing input into the design of the Project. Accordingly, Contractor may be involved during Architect's Preliminary Design Services to provide cost estimating services, value engineering and other services on Owner's behalf.

Architect hereby agrees to fully cooperate with and encourage the participation of Contractor in all phases of the Design Services" (Owner A –Architect Design Agreement, 2010, p. 8).

7.2.3 **Method of Compensation**

"Contractor has established a Construction GMP based upon fifty percent (50%) Design Development Documents and that said Construction GMP, less the IPD Contingency, is within the Project Budget. The parties further acknowledge that Architect is in the process of preparing ninety-five percent (95%) Construction Documents with Contractor's involvement. However, if after completion of the ninety-five percent (95%) Construction Documents, Contractor and Owner reasonably conclude that the final design of the Project, once constructed, will or is likely to exceed the Project Budget (taking into account the IPD Contingency), the Owner shall have the following options or combination of options to be exercised in Owner's sole discretion:

.1 accept the updated Construction GMP, with or without alternates, and approve an increase in the Project Budget;

.2 authorize rebidding or renegotiating of the Project within a reasonable time;

.3 in consultation with the Architect, revise the Project program, scope, or quality as required to reduce project costs to comply with the Project Budget; or

.4 require the Architect to modify the design of the Project without additional cost to the Owner to achieve the Project Budget, except that Architect shall be compensated for design modifications if the GMP was increased because of design changes requested by Owner between

the fifty percent (50%) design and the ninety-five percent (95%) design" (Owner A-Architect Design Agreement, 2010.

- *Architect's compensation: Fixed fee*

Architect's investment in the IPD contingency pool, Architect's profit and a portion of their fee are at risk. In worst case, the Architect's bonus could go away, and they could also lose a portion of their fee (Architect).

Architect's MOB At Risk Amount: One Hundred Fifty-One Thousand Eight Hundred Ninety-Seven and No/100 Dollars ($151,897.00) (IPD Agreement, P.2).

Architect's 'Owner A' Improvements At Risk Amount: Five Hundred Fifty-One Thousand Three Hundred Thirty and No/100 Dollars ($551,330.00) (IPD Agreement, P.3).

- *Contractor's compensation: Fixed fee and a GMP*

  "Initial Construction GMP and the Clarifications and Assumptions are based on (50%) Design Development Documents. Architect is in the process of preparing the one hundred percent (100%) Construction Documents based on the Drawings and Specifications. Once (i) Architect has prepared the one hundred percent (100%) Construction Documents, and (ii) Owner has by written notice to Architect and Contractor approved the one hundred percent (100%) Construction Documents, the approved one hundred percent (100%) Construction Documents shall become the Drawings and Specifications for purposes of this Construction Agreement" (Owner A -Contractor Construction Agreement, 2010 pp.6-7).

  "Within ten (10) weeks of receipt of such Owner approval notice, Contractor shall propose an updated Construction GMP and reduced set of Clarifications and Assumptions (the "Contractor Refinement Proposal"), all based on the approved one hundred percent (100%) Construction Documents. In no event shall the Contractor-proposed updated Construction GMP, be higher than the Construction GMP established as of the date of this Construction Agreement" (Owner A -Contractor Construction Agreement, 2010, p.7).

MOB GMP: Thirty-Four Million Eight Hundred Fifty-One Thousand One Hundred Twenty-Six Dollars ($34,851,126), as of November 25, 2009 (IPD Agreement, p.4).

Owner A Improvements GMP: One Hundred Seventy Million Seven Hundred Eighty-Six Thousand One Hundred Thirty-Three Dollars ($170,786,133), which amount reflects Owner A's portion on Contractor's GMP Summary dated as of November 25, 2009 (IPD Agreement, p.6).

Contractor's MOB At Risk Amount: Three Hundred Eighty-Seven Thousand Nine Hundred Two and No/100 Dollars ($387,902.00) (IPD Agreement, P.3).

Contractor's 'Owner A' Improvements At Risk Amount: One Million Seven Hundred Eighty-Seven Thousand Six Hundred Fifty-Eight and No/100 Dollars ($1,787,658.00) (IPD Agreement, P.3).

Contractor's Fee for 'Owner A' Improvements: Three Million Four Hundred Twenty-two Thousand Five Hundred Eight and 00/100 Dollars ($3,422,508.00) (Owner A -Contractor Construction Agreement, 2010, p. 12).

Contractor's Fee for Owner B Improvements: Seven Hundred Two Thousand Four Hundred Eighty-eight and 00/100 Dollars ($702,488) (Owner B-Contractor Construction Agreement, 2010, p.11).

Contractor's investment in IPD contingency pool, and a portion of their profit (40%) is at risk. Contractor's direct cost and overhead cost, however, is guaranteed (Contractor).

7.2.4 **Method of Selection**

The Owner sent out an RFP for a developing partner and that is how the Owner B/PM got selected. The Owner A and the Owner B/PM together prepared and sent out an RFP to select the GC and the Architect (Owner).

The IPD was not discussed when the team got selected. As a result, familiarity with the IPD was not a factor in selecting the team members. Table 7-2 illustrates the team selection criteria.

- *Contractor Selection*

Contractor was selected through RFP process; the selection criteria were qualifications and fee. The contractor has a GMP with the Cost plus Fixed Fee. Cost is a guaranteed price. When responding to the RFP in this project, the contractor only submitted their fee and insurance rate. According to the contractor they self-perform a great portion of work with their own work force (Contractor).

- *Architect Selection*

Quality of design work and qualification of the team was a determining selection factor (Owner B/PM).

During the interview process, the Architect suggested to the Owner the colocation of the team during the design phase, and also asked the Owner about their definition of success. The Architect's attitude seemed to strike a chord with the owner, and led to their selection (Architect).

Table 7-2: Selection criteria for the IPD Core Team in "PROJECT TWO"

Selection criteria	Architect	Contractor	Owner's rep. (PM)
Qualification based on experience, familiarity with the work, knowledge, competency, etc.	x	x	x
Price (Fee)		x	x
Design	x		
Innovative approach to planning	x		
Familiarity with IPD (collaborative) agreement			

- *Trades Selection*

The General Contractor selects the qualified subcontractors and manufacturers and submits the list to the Architect and the Owners for their review. The Architect and the Owner shall notify the Contractor in a timely manner if they have reasonable objection after due investigation (MOB General Conditions, Section 6.2.1).

> "Preparation of the IPD Agreement has been a joint effort of the Parties and the resulting document shall not be construed more severely against one of the Parties than against the others" (IPD Agreement, p.19, section 9.6).
>
> "Owner reserves the right to object to any subconsultant or subcontractor proposed to be used by Architect provided Owner shall have a reasonable objection thereto" Owner A -Architect Design Agreement, 2010, p.8).

7.3 Micro Elements of PDCS

Figure 7-4 illustrates the micro elements of PDCS in "PROJECT TWO". The following sections provide additional information on each element.

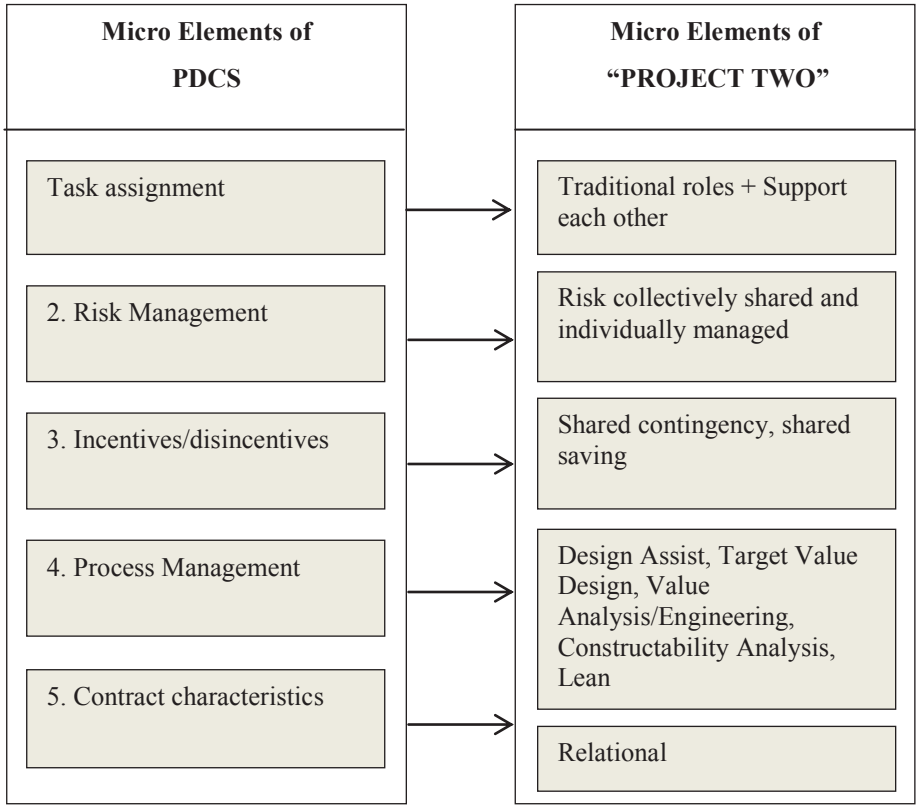

Figure 7-4: Micro elements of PDCS in "PROJECT TWO"

7.3.1 Task Assignment

This section provides information on tasks assigned to the Owner, the Architect, the GC, IPD Core Team, and the project Executive Team. The information is the combinatorial result of data collected through the IFOA and the individual interviews with IPD team members. For each of the above entities a table is developed that briefly illustrates the key tasks assigned to each party.

> "By forming the IPD Team and signing a single form of agreement, the Parties do not intend to create a partnership between or among any of the members, and no member shall conduct itself in any way to suggest that such a partnership exists. Each member shall bear professional responsibility only as specifically provided in this Agreement. This Agreement is not a design-

build agreement and shall not make any party responsible for the professional errors or omissions of any other party except as expressly provided in this Agreement" (IPD Agreement, p.7, section 2.1.3).

7.3.1.1 Owner's Roles and Responsibilities

Table 7-3 summarizes the Owner's roles and responsibilities in "PROJECT TWO".

Table 7-3: Owner's roles and responsibilities in "PROJECT TWO"

Participants	Tasks
Owner	Financing
	Permits and approvals
	Furnishing physical characteristics and legal description of the project site
	Furnishing and approving in information required by Architect/ Enabling Architect to perform
	Causing Architect to take appropriate action
	Furnishing Drawings and Specifications to Contractor
	Furnishing and approving information required by Contractor in a timely manner
	Causing Contractor to take appropriate action per contract
	Testing and inspections

- *Financing*

It is the Owner's responsibility to finance the project and furnish reasonable evidence to the Architect and the GC that financial arrangements have been made to fulfill its obligations under the contract (MOB General Conditions, p.5).

- *Furnishing physical characteristics and legal description of the project site*

Owner is responsible for furnishing surveys, geotechnical services information related to physical characteristics, legal description of the project site, and utility location to the Architect and the GC.

Even though Owner furnishes to the Architect and the GC report of Geotechnical tests, it does not assume any responsibility with respect to the sufficiency and accuracy of the investigation report (MOB General Conditions, p.6).

- *Permits and approvals*

  "Owner shall secure and pay for the necessary approvals, permits, licenses, inspections, easements, assessments and charges required for the development of the project" (MOB General Conditions, p.6).

- *Enabling Architect to perform- Furnishing and approving in information required by Architect*

  "Owner agrees to use all reasonable efforts to enable Architect to perform the Work in an expeditious manner by furnishing and approving in a timely manner, information required by Architect, and by making payments to Architect in accordance with the Contract Documents" Owner A -Architect Design Agreement, 2010, p.9).

- *Causing Contractor to take appropriate action per contract*

  "Whenever the Contract Documents require action by Contractor, Owner shall use all reasonable efforts to cause Contractor to take appropriate action" Owner A -Architect Design Agreement, 2010, p.9).

- *Testing and inspections*

  "Owner shall furnish structural, mechanical, chemical, geotechnical, and other laboratory or on-site tests, inspections or reports as required by law or the Contract Documents" (MOB General Condition, p.6).

- *Furnishing Drawings and specifications to the GC*

The Owner shall provide the GC free of charge, a set of reproducible Drawings and Specifications prepared by the Architect (MOB General Condition, p.6).

- *NOT responsible for Design, Construction, or Safety*

The MOB General Conditions section 2.3.2. specifically emphasizes that the Owner is NOT responsible for design, construction means and methods, and safety of work.

- *Causing Architect to take appropriate action*

  "Whenever the Contract Documents require action by Architect, Owner shall use all reasonable efforts to cause Architect to take appropriate action" (Owner A -Architect Design Agreement, 2010, pp.8-9).

- *Furnishing and approving information required by Contractor, in a timely manner*

  "Owner agrees to use all reasonable efforts to enable Contractor to perform the Contractor's Work in an expeditious manner by furnishing and approving, in a timely manner, information required by Contractor, and by making payments to Contractor in accordance with the requirements of the Contract Documents" (Owner A –Contract Construction Agreement, 2010, pp.8-9).

7.3.1.2 Architect's Roles and Responsibilities

Table 7-4 summarizes the Architect's roles and responsibilities in "PROJECT TWO".

Table 7-4: Architect's roles and responsibilities in "PROJECT TWO"

Participants	Tasks
Architect	Project administration and management services
	Research applicable design criteria and building and other applicable codes
	Consult with Owner, attend meetings, and coordinate Architect's consultants
	Field measurement of un-concealed conditions
	Design schedule
	Design to budget
	Preparation of change orders
	Making payment to Architect's consultants
	Review of disputes
	Inspection and authority to reject non-conforming works
	Inspections to determining substantial and final completion
	Issuing certification of payment due Contractor

- *Administration and management services*

  "Architect shall perform and manage the Design Services, and administer the Project, in accordance with the Contract Documents and the Standard of Care (LIABILITY). Architect shall consult with Owner, research applicable design criteria and building and other applicable codes,

attend Project meetings, communicate with members of the Project team, and issue progress reports. Architect shall coordinate the services provided by Architect and Architect's subconsultants and subcontractors with those services provided by Owner and Owner's consultants" (Owner A –Architect Design Agreement, 2010, p.9).

- *Field measurement of un-concealed conditions*

"Before beginning work on the Project, Architect shall take field measurements of any existing conditions related to the Work and shall observe any readily visible conditions at the site affecting it. However, Architect shall not be obligated to review concealed conditions, such as those found in walls and shafts, above ceilings, below the ground surface, and in similar spaces. Field measurements are for the purpose of facilitating the design of the Project by Architect and the construction of the Work by Contractor" Owner A –Architect Design Agreement, 2010, p.9).

- *Issuing certification of payment due Contractor*

"Based on Architect's observations and evaluations of Contractor's Applications for Payment, Architect shall review and certify the amounts due Contractor and shall issue Certificates for Payment in such amounts" (MOB General Conditions, p.18).

"Architect shall, within seven (7) days after receipt of Contractor's Application for Payment, either issue to Owner a Certificate for Payment, with a copy to Contractor, for such amount as Architect determines is properly due, or notify Contractor and Owner in writing of Architect's reasons for withholding certification in whole or in part as provided in Subparagraph 10.5.1." (MOB General Conditions, p.31).

- *Design to budget*

"Architect agrees to provide all Design Services in such a manner that the design of the Project, once constructed, will not exceed the Project Budget" Owner A –Architect Design Agreement, p.7).

- *Inspection and authority to reject non-conforming works*

"Architect shall reject Work which Architect discovers does not conform to the Contract Documents. However, Architect shall not have the authority to stop the Work on the site. Whenever Architect considers it necessary or advisable for implementation of the intent of the Contract Documents, Architect will have authority to require additional inspection or testing of

the Work in accordance with Paragraph 14.5.2 and Paragraph 14.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of Architect nor a decision made in good faith to exercise or not to exercise such authority shall give rise to a duty or responsibility of Architect to Contractor, Subcontractors, material and equipment suppliers, any of their respective agents or employees, or other persons performing portions of the Work" (MOB General Conditions, p.18).

- *Preparation of change orders*

  "Architect will prepare Change Orders and Construction Change Directives, subject to the approval of Owner, and may authorize minor changes in the Work as provided in Paragraph 8.4 below." (MOB General Conditions, p.18).

- *Inspections to determining substantial and final completion*

  "Architect shall conduct observations to determine the date or dates of Substantial Completion and the date of Final Completion, will receive and forward to Owner for Owner's review and records written warranties and related documents required by the Construction Agreement or the Common Contract Documents and assembled by Contractor, and issue a final Certificate for Payment upon compliance with the requirements of the Contract Documents" (MOB General Conditions, p.18).

- *Review of disputes*

  "Upon request of Owner, claims, disputes and other matters in question relating to the execution or progress of the Work or the interpretation of the Contract Documents may be referred to Architect for initial recommendation, which Architect shall render in writing within a **reasonable** time, not to exceed fifteen (15) days after the date on which such request is made." (MOB General Conditions, p.18).

- *Design schedule*

  "Before requesting any payment under the Design Services Agreement, and as a condition precedent to the enforceability of the Design Services Agreement by Architect, Architect shall have submitted to Owner, and Owner shall have accepted in writing, a proposed schedule setting out the dates on which Architect plans to complete schematic design phase, design development phase, construction document phase, and bidding or negotiation phase. This schedule shall also

set out the dates by which any actions, decisions, or information is required from Owner in order to permit Architect to perform according to this schedule" (MOB General Conditions, p.19).

MOB General Conditions, section 5.1.17 specifically emphasizes that the Architect is NOT responsible for construction means and methods, safety, non-conformance of the work with construction documents.

- *Pay its subconsultants and subcontractors*

  "Architect shall promptly pay its subconsultants and subcontractors, as and when due, in accordance with the terms of its agreements with its subconsultants and subcontractors" Owner A –Architect Design Agreement, 2010, p.9).

7.3.1.3 GC's Roles and Responsibilities

Table 7-5 summarizes the GC's roles and responsibilities in "PROJECT TWO". A few of these tasks are explained below.

Table 7-5: Contractor's roles and responsibilities in "PROJECT TWO"

Participants	Tasks
Contractor	Procurement of materials and equipment
	Construction and proper installation of the work
	Safety
	Arranging tests and inspection

- *Procurement of materials and equipment*

  "Contractor accepts assignment of, and liability for, all purchase orders and other agreements for procurement of materials and equipment that are identified as part of the Contract Documents" (MOB General Conditions, p.25).

- *Safety*

  "Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Work" MOB General Conditions, p.25).

  "Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions

for installation or performance of equipment or systems, all of which remain the responsibility of Contractor as required by the Contract Documents. Architect's review of Contractor's submittals shall not relieve Contractor of any of its obligations under the Contract Documents. Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by Architect, of any construction means, methods, techniques, sequences or procedures. Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component" (MOB General Conditions, p.18).

- *Arranging tests and inspection*

"Tests, inspections and approvals of portions of the Contractor's Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity designated by Owner, or with the appropriate public authority, and Owner shall bear all related costs of tests, inspections and approvals" (MOB General Conditions, p.43).

7.3.1.4 IPD Core Team roles and responsibilities

Table 7-6 summarizes the IPD Core Team's roles and responsibilities in "PROJECT TWO". A few of these tasks are further explained below.

Table 7-6: Core IPD Team's roles and responsibilities in "PROJECT TWO"

Participants	Tasks
Core IPD Team	Training the team on IPD principles
	Quality control
	Day-to-day management, including the scheduling and coordination
	Review job progress
	Review and resolve issues
	Allocate cost issues and contingencies
	Executing the decisions and directives of the Project Executive Team

- *Training the team on IPD principles*

"A primary responsibility of each Party is to communicate to its employees the importance of adhering to "Integrated Project Delivery" principles and to provide training and guidance as necessary. The Core IPD Team shall assist the Parties in these efforts and shall be responsible for

monitoring training for the employees of key Project participants focused on Integrated Project Delivery principles" (IPD Agreement, p.9).

- *Quality control*

  "The Core IPD Team shall develop mutual understandings with respect to Project quality and communicate such understandings to all Project participants" (IPD Agreement, p. 9).

  "The Core IPD Team shall monitor Project quality through the implementation of appropriate Project quality control and assurance procedures. The Core IPD Team's Project quality understandings and procedures shall be set forth in writing and delivered to the Project Executive Team for review and approval" (IPD Agreement, p. 9).

- *Day-to-day management, including the scheduling and coordination*

  "The Core IPD Team shall be responsible for the day-to-day management of the Project, including the scheduling and coordination of the Parties' activities required to complete the Project in a collaborative and integrated manner. The Core IPD Team is responsible for establishing the procedures and processes necessary to achieve Project goals including such protocols and understandings as are necessary to implement collaborative technologies, such as Building Information Modeling" (IPD Agreement, p. 8).

- *Review job progress, review and resolve issues, allocate cost issues and contingencies*

  "The Core IPD Team shall meet weekly to review job progress, review and resolve issues and claims, review and allocate cost issues among the various parties and Project Contingencies and review and evaluate performance of the Parties (IPD Agreement, p. 8).

- *Executing the decisions and directives of the Project Executive Team*

  "The Core IPD Team is responsible for executing the decisions and directives of the Project Executive Team" (IPD Agreement, p. 8).

7.3.1.5 Project Executives Team's Roles and Responsibilities

Table 7-7 summarizes the Executive Team's roles and responsibilities in "PROJECT TWO". These tasks are further explained below.

Table 7-7: Project Executive Team's roles and responsibilities in "PROJECT TWO"

Participants	Tasks
Project Executive Team	Review Project progress, Project goals, and expenditures
	Control all expenditures of the Project contingencies

- *Review Project progress, Project goals, and expenditures*

  "The Project Executive Team shall meet monthly with the Core IPD Team to review Project progress, Project goals, expenditures of Project Contingencies and any other issues raised by the Core IPD Team" (IPD Agreement, p. 8).

- *Control all expenditures of the Project contingencies*

  "The Project Executive Team shall decide and control all expenditures of the Project contingencies in accordance with the Contingency Use Guidelines" (IPD Agreement, p. 8).

7.3.2 **Risk Management**

According to the IPD Core Team, like any other type of project delivery, the Owner is the party most at risk in this type of arrangement. The summary of risk management assignments are presented in Table 7-8.

Table 7-8: Risks assignment strategies in "PROJECT TWO"

Risk Sharing/Allocation	Risks Category	Risks	Responsibility for Risk Management			
			Owner	PM	Architect	Contractor
Shared risks between Owner, Architect, and Contractor	Budget overrun	Risk of cost overrun	X	X	X	X X
		Risk of cost overrun due to change orders	X X		X	X
	Design errors	Risk of design errors and omissions	X		XX	X
Risks assumed by Owner	Differing condition	Risk for Differing Site Condition	X			
		Risk of Concealed or Unknown Condition	X			
	Delay	Risk of delay due to adverse weather	X			
		Risk of delay due to force majeure	X			
		Risk of Owner-cased delay	X			
Risks allocated to Architect and Contractor	Accuracy of contract documents	Risk of the inaccuracy of the information furnished in the contract			X	X
	Delay	Risk of non-owner-caused delay			X	X
	Contract termination	Risk of contract termination without cause			X	X
Risk allocated to Architect	Non-compliancy with law	Risk of non-compliance with law			X	
	Budget over-run	Risk of budget overrun due to design			X	
	Defective design	Risk of defective/non-conforming design services, or claims related to design and the Architect			X	
	Lien	Risk of lien as a result of Architect's failure to meet its obligation			X	

	Delay	Risk of Architect-caused delay			X	
Risk allocated to Contractor		Safety risks				X
Risk allocated to Contractor	Measurements	Risk of inaccuracy of site measurement				X
		Risk of non-compliance with the design				X
	Budget Overrun due to force majeure	Risk of cost(fee) overrun resulting from Force Majeure				X
	Delay	Risk of Contractor- caused delay				X
	Property damage	Risk of damages Caused by CM/GC or their Subs				X

The owner has the greatest risk (Owner/PM & Contractor). Next, the contractor has the next highest risk, and the architect has the least risk. According to the contractor, in a market where margins are so tight they would pursue any opportunity that would bolster their margin. There is a great reward for cases like this as high risk yields high return, and if the contractor believes that they could perform the job, that would be an attractive project to pursue (GC). According to the IPD Core Team, like any other type of project delivery, the Owner is the party most at risk in this type of arrangement.

The following sections provide further insight into the assignments of risks among the team.

7.3.2.1 **Risks shared among IPD team (Owner, Architect, and Contractor)**

- *Risk of cost overrun*

  "The liability of Contractor for Construction Costs in excess of the Owner A Improvements GMP or MOB GMP under the Owner A Improvements Construction Agreement or MOB Construction Agreement may be reduced (not eliminated or limited) if and to the extent the Project Executive Team agrees that it is in the best interests of the Project and otherwise in accordance with the Contingency Use Guidelines and other terms of this Agreement to utilize the applicable IPD Team Contingency to pay such excess Construction Costs" (IPD Agreement, p.12).

  "Costs in Excess of the Construction GMP: Except as set forth in the IPD Agreement, Contractor shall be responsible for all Costs of the Contractor's Work in excess of the Construction GMP" (Owner A -Contractor Construction Agreement, 2010, p.12).

In other word, costs and expenses which would cause the GMP to be exceeded shall be paid by the CM/GC without reimbursement by the Owner, when such a cost over-run does not fall into change order, or applicable to the IPD team performance contingency.

- *Risk of cost overrun due to change orders*

  "Contractor shall not be entitled to any adjustments to the Contract Time or the Construction GMP or any other additional compensation or extensions of time for work performed, which is additional to or different from the Work specified in the Contract Documents, unless such additional or different work is authorized by a Change Order, a Construction Change Directive or order for- 25 -minor change in Contractor's Work issued in accordance with this Article 8 prior to the additional or different work being commenced." (MOB General Conditions, pp.25-26).

  "The liability of Owner to pay amounts due to Contractor or Architect under Existing Agreements may be reduced (not eliminated or limited) if and to the extent the Project Executive Team agrees that it is in the best interests of the Project and otherwise in accordance with the Contingency Use Guidelines and other terms of this Agreement to utilize the applicable IPD Team Contingency to pay such amounts. The intent is that change orders from the Contractor and additional service requests from Architect that relate to Project costs covered by the IPD Team Contingency, as described in the Contingency Use Guidelines, shall first be paid out of the applicable IPD Team Contingency and by the additional "at risk" amounts of Owner, Architect and Contractor as described in more detail below" (IPD Agreement, p.12).

- *Risk of design errors and omissions*

The Architect shall indemnify the Owner from claims, losses, damages, and liabilities resulting from the Architect's breach of the Design Services Agreement and/or from the negligent acts, errors and omissions, or intentional misconducts of the Architect (MOB General Conditions, p.17).

"The liability of Architect under the Owner A Improvements Design Services Agreement or MOB Design Services Agreement to pay for damages, costs or expenses caused by Architect's errors or omissions not covered by Architect's professional liability insurance may be reduced (not eliminated or limited) if and to the extent the Project Executive Team agrees that it is in the best interests of the Project and otherwise in accordance with the Contingency Use Guidelines and other terms of this Agreement to utilize the applicable IPD Contingency to pay such damages, costs and expenses" (IPD Agreement, p.12).

Limitation of liability of the Contractor for Design errors by design/build Subcontractor

> "Owner and Contractor agree that in the event of any claim arising solely from the design aspects of performance of any of the Design/Build Subcontractors, that while Owner shall have the ability as a matter of contract to hold the Contractor responsible for the full amount of such claim, Owner agrees to limit Contractor's responsibility therefore to the amount of insurance applicable to the loss from any insurance maintained by Design/Build Subcontractor. In the event of such claim, Owner and Contractor shall cooperate, each at their own expense, in the presentation and pursuit of any and all such claims, including without limitation and if applicable, assignment of their contractual rights to each other" (MOB General Conditions, p.23).

7.3.2.1.1 **Risks allocated to the Architect and the GC**

- *Risk of the inaccuracy of the information provided in the contract*

The Owner has shifted the risk of inaccuracy of the information provided in the document and supplied by the Owner to the GC and the Architect. Even though the Owner furnishes to the Architect and the GC the report of Geotechnical tests, it does not assume any responsibility with respect to the sufficiency and accuracy of the investigation report (MOB General Conditions, p.5).

> "Owner does not make any representation or warranty that any information provided to contract by or on behalf of owner is accurate, correct, complete, fit, for its intended purpose or can be used without infringing any patent, copyright, trademark, or other intellectual property rights of third parties" (MOB General Conditions, p.3).

> "Owner acknowledges and agrees that Contractor is not an architect, engineer or designer, and that, except as otherwise provided in Paragraph 6.5 of the General Conditions, no provision of this Construction Agreement or any of the Contract Documents shall be construed to create any responsibility of or liability upon, Contractor for the accuracy, adequacy, sufficiency, or safety of any element or component of the design of the Project" (Owner A-Contractor Construction Agreement, 2010, p.8).

- *Risk of non-owner caused delay*

  "In the cases of Non-Owner-Caused Delay each of the Contractor's Owner A Improvements/MOB IPD Team Bonuses and the Architect's 'Owner A' Improvements/MOB IPD Team Bonuses shall be reduced as follows: (i) by twenty-five percent (25%) for a one (1) week delay, (ii) by an additional twenty-five percent (25%) for a two (2) week delay, and (iii) a three (3) week delay shall deplete each of the Contractor's 'Owner A' Improvements/MOB IPD Team Bonus and the Architect's 'Owner A' Improvements/MOB IPD Team Bonus in their entirety" (IPD Agreement, pp.17-18).

  "Costs caused by delays or by improperly times activities or defective construction shall be borne by the party responsible therefor" (MOB General Conditions, p.25).

- *Risk of contract termination without cause*

  "The Design Services Agreement and/or the Construction Agreement may be terminated by Owner for its convenience and without cause upon not less than ten (10) days' prior written notice to Contractor or Architect, as applicable. In such event, (i) Contractor shall only be entitled to recover payment from Owner for Work executed (including profit and overhead at the rates stated in the Construction Agreement on such executed Work) plus actual de-mobilization costs incurred in a reasonable and prudent business manner, and (ii) Architect shall be entitled to receive payment for Design Services properly performed and Reimbursable Expenses incurred by Architect prior to such termination. Owner shall not be required to pay, and Contractor and Architect each respectively waive any rights of recovery for, any lost or anticipated profits and overhead on any Work not performed" (MOB General Conditions, p.46).

7.3.2.2 **Risks allocated to the Owner**

The Owner B/PM is essentially at risk for the adequacy of the service and performance. The Owner A expects the PM to deliver the project on time and under budget. In fact, as part of the agreement between the Owner A and the PM, there is an incentive bonus payment equal to one month professional project management fee at the discretion of the Owner to pay, if the PM delivers the project on time and under budget (Owner/PM).

- *Risk for differing site condition*

Differing site condition is the Owner's liability and is managed through the Owner's contingency (Owner/PM).

- *Risk of concealed or unknown condition*

  "If conditions are encountered at the Project site which are: (1) subsurface physical conditions, including adverse environmental conditions, which differ materially from those indicated in the Contract Documents; or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist in the general surrounding area, then notice by the observing party shall be given to the other party promptly before conditions are disturbed, and in no event later than fourteen (14) days after first observance of the conditions. Owner (with the assistance of Architect) shall promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the cost or time required for performance of any part of the Work, shall recommend an equitable adjustment in the Construction GMP or Contract Time, or both. If Owner (with the assistance of Architect) determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Common Contract Documents is justified, Owner shall so notify Contractor in writing, stating the reasons" (MOB General Conditions, p.20).

- *Risk of delay due to adverse weather*

  "If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the scheduled construction" (MOB General Conditions, p.20).

- *Risk of delay due to force majeure*

  "If Contractor is delayed at any time in the progress of the Work caused by strikes (other than those directly caused by the failure to negotiate in good faith of Contractor), acts of God, Unusually Severe Weather Conditions, unavoidable casualties, acts of the public enemy, acts of terrorists, governmental embargo restrictions, strikes, labor disputes, or similar causes beyond the reasonable control of Contractor which, despite the exercise of such commercially reasonable efforts to mitigate the effects thereof as the then circumstances dictate or allow, delay progress of the Work, then the Contract Time shall be extended by Change Order to the extent of such delay. Contractor's sole remedy for such delay shall be an extension of the Contract Time. In no event shall owner be liable to contractor or any subcontractor, vendor or supplier of contractor, any other person or any surety for or any employee or agent of any of them, for any damages arising out of or associated with any delay whatsoever" (MOB General Conditions, p.28).

7.3.2.3 **Risks allocated to the Architect**

- *Risk of non-compliance with law*

  "Architect represents and warrants that all of Architect's Work shall comply with all applicable laws, ordinances, building codes, rules and regulations of any governing authority or agency having jurisdiction (specifically including without limitation the Department of Health)" (MOB General Conditions, p.18).

- *Risk of budget overrun due to design*

  "Architect agrees to provide all Design Services in such a manner that the design of the Project, once constructed, will not exceed the Project Budget. Owner and Architect acknowledge that, as of the date of this Design Services Agreement, Contractor has established a Construction GMP (as defined in the General Conditions) based upon fifty percent (50%) Design Development Documents and that said Construction GMP, less the IPD Contingency, is within the Project Budget. The parties further acknowledge that Architect is in the process of preparing ninety-five percent (95%) Construction Documents with Contractor's involvement. However, if after completion of the ninety-five percent (95%) Construction Documents, Contractor and Owner reasonably conclude that the final design of the Project, once constructed, will or is likely to exceed the Project Budget (taking into account the IPD Contingency), the Owner shall have the following options or combination of options to be exercised in Owner's sole discretion:

  1. accept the updated Construction GMP, with or without alternates, and approve an increase in the Project Budget;

  2. authorize rebidding or renegotiating of the Project within a reasonable time;

  3. in consultation with the Architect, revise the Project program, scope, or quality as required to reduce project costs to comply with the Project Budget; or

  4. require the Architect to modify the design of the Project without additional cost to the Owner to achieve the Project Budget, except that Architect shall be compensated for design modifications if the GMP was increased because of design changes requested by Owner between the fifty percent (50%) design and the ninety-five percent (95%) design" (Owner A – Architect Design Agreement, 2010, pp.7-8).

- *Risk of defective/non-conforming design services, or claims related to design and the Architect*

  "In the event of: (a) a breach or default by Architect in the performance of the Design Services hereunder; (b) an error or omission by Architect (or its employees, subconsultants or subcontractors) in performing the Design Services hereunder pursuant to the Standard of Care; (c) the Design Services provided hereunder do not conform to all Applicable Laws as of the date of the completion of same; or (d) if the Project is delayed by acts or neglect of Architect (or Architect's employees, subconsultants or subcontractors), Architect shall be liable to Owner for any and all damages, expenses (including reasonable attorneys' fees), costs, actions or liability arising therefrom, including, but not limited to, additional design and construction expenses" (Owner A- Architect Design Agreement, 2010, pp.7-8).

  "Owner shall have the right, but not the obligation, to withhold from any invoiced amount an ppropriate amount based upon:

  1. delivery of defective or non-conforming services by Architect as determined in the reasonable judgment of Owner;

  2. third party claims filed as a result of Architect's failure to comply with its Standard of Care;

  3. failure of Architect to pay any of its subconsultants or subcontractors;

  4. failure of Architect to submit proper invoices with all required attachments and supporting documentation; or

  5. failure of Architect to comply with any provision of this Design Services Agreement after five (5) days' written notice of such noncompliance and the failure to cure or commence and diligently pursue a cure by Architect" (Owner A- Architect Design Agreement, 2010, pp.7-8).

- *Risk of lien as a result of Architect's failure to meet its obligation*

  "Architect agrees that, provided Owner has paid Architect in accordance with this Design Services Agreement: (a) Owner has the right to a lien free Project; and (b) if any lien or claim is filed or made against the job site, the Project or Owner as a result of Architect's failure to meet its obligations, Owner, upon twenty-one (21) days prior written notice to Architect, shall have the right to settle or bond around said lien or claim directly and deduct the cost of the settlement or bonding from payments due Architect (and, if the amount still due Architect is insufficient to

cover such costs, to recover the shortfall from Architect directly), provided that Architect within such twenty-one (21) day period has not settled such lien or claim or bonded around such lien claim in a manner reasonably satisfactory to Owner. If Architect is insolvent or persistently fails to pay it subconsultants or creditors on a timely basis, Owner may make joint payments to Architect and its creditors" (Owner A- Architect Design Agreement, 2010, pp.7-8).

7.3.2.4 **Risks allocated to the GC**

- *Risk of inaccuracy of site measurement*

The Owner has shifted the inaccuracy of the site measurement information furnished in the contract to the GC.

> "Contractor shall verify measurements at the Project site and shall be responsible for the correctness of such measurements. Any difference which may be found shall be submitted to Architect for interpretation before proceeding with the work, otherwise there shall be no claim for an increase in the Construction GMP" (MOB General Conditions, p.3).

- *Risk of non-compliance with the design*

> "Contractor shall promptly correct Contractor's Work rejected by Architect or Owner for failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion, and whether or not fabricated, installed or completed. Contractor shall bear costs of correcting such rejected Work, including additional testing and inspections and compensation for Architect's services and expenses made necessary thereby" (MOB General Conditions, p.41).

Such contractor's liability is in place up to (1) year after the date of Substantial Completion of the Work.

- *Risk of cost (fee) overrun resulting from Force Majeure*

If there is an earthquake and the project is delayed, the Contractor would get an extension in time; however, would not get an extension in cost associated with that time. The insurance policy will pay for any earthquake damage. So, there is a risk associated with Force Majeure for the contractor (Contractor).

- *Risk of contractor- caused delay*

"If Contractor fails to achieve Substantial Completion of the Initial Work by the Initial Work Target Substantial Completion Date, and such failure continues for thirty (30) days beyond the Initial Work Target Substantial Completion Date (the "Substantial Completion Grace Period"), each day of delay in achieving in achieving Initial Work Substantial Completion beyond the Substantial Completion Grace Period shall constitute a 'Contractor Delay Day'.

Contractor agrees to pay to Owner as liquidated damages for such delay an amount equal to the sum of the amount of Fifteen Thousand and 00/100 Dollars ($15,000.00) per each Contractor Delay Day. Except the liquidated damages stated above, Contractor shall not be liable to Owner, nor shall Owner have any recourse against Contractor, for any direct or indirect damages as a result of the Contractor's failure timely to meet the Initial Work Target Substantial Completion Date or the Hospital Work Target Substantial Completion Date. All sums payable to Owner shall be paid by Contractor to Owner within ten (10) days following demand therefore, or, at Owner's election, may be credited against amounts owing to Contractor hereunder" (Owner A- Contractor Construction Agreement, 2010, p.10).

Subsequently, the GC has also put in its contract with the subcontractors, the liquidated damage provisions and made the subcontractors responsible for the payment of the liquidated damage should they be the cause of delay (Contractor).

- *Risk of damages caused by CM/GC or their subs*

  "Contractor shall promptly remedy damage caused by Contractor to completed or partially completed construction or to property of Owner or separate contractors" (MOB General Conditions, p.25).

  "Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property … in whole or in part by Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which Contractor is responsible …, except damage or loss attributable to acts or omissions of Owner, or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of Contractor" (MOB General Conditions, p.36).

7.3.3 **Risk Financing Strategies**

Table 7-9: Risk financing strategies in "PROJECT TWO"

Risk Financing Strategies		
Contingency	Contractor's contingency	
	Design and estimating contingency	
	IPD team contingency	
	Owner's contingency	
	Architect's at-risk amount	
	Owner's at-risk amount	
Insurance	Owner's Insurance	Commercial General Liability
		Automobile Liability - Any Auto (including Hired and Non-Owned Autos)
		Worker's Compensation and Employers Liability
		Excess Liability - Umbrella Form
	Contractor's Insurance	Commercial general liability insurance
		Automobile liability insurance
		Worker's compensation and employer's liability insurance
		Excess liability insurance
	Subcontractor's Insurance	
	Architect's Insurance	Commercial General liability
		Automobile liability
		Workers' compensation
		Excess liability
		Professional liability: Errors and omissions insurance
At-Risk Amount	Contractor's at-risk fee	
	Architect's at-risk fee	
	Owner's at-risk amount	
Waiver of Subrogation between all participants (Owner, Architect, Contractor, Subs, etc.)		
Bonds		

7.3.3.1 **Contingencies**

Project Contingencies include, (i) the Construction Contingencies, (ii) the Design and Estimating Contingencies, (iii) the IPD Team Contingencies, and (iv) the Owner Contingencies (IPD Agreement, P.5).

The IPD Core Team decides on how certain costs that were not anticipated are allocated, whether they go to one contingency or another. There are three types of contingency pools in this project: Owner contingency, IPD contingency, and Construction contingency (Owner, Project Manager).

If the IPD Core Team is not able to reach an agreement on cost allocation and contingency use, then the Senior Groups gets involved to address the issue. Senior Group usually gets together once a month, to discuss the project condition and how they could improve performance and reinforce collaboration (Project manager).

- *IPD Team Contingencies*

The IPD Team Contingencies shall mean, collectively, (i) the MOB IPD Team Contingency and (ii) the 'Owner A' Improvements IPD Team Contingency (IPD Agreement, P.3).

> "The amounts of the 'Owner A' Improvements IPD Team Contingency and MOB IPD Team Contingency are excluded from the 'Owner A' Improvements GMP and the MOB GMP, respectively. The 'Owner A' Improvements IPD Team Contingency shall be funded by 'Owner A' on an as needed basis, and the MOB IPD Team Contingency shall be funded by Owner B on an as needed basis" (IPD Agreement, p.13).
>
> "The IPD Team Contingencies shall be used to pay certain Project costs in accordance with the Contingency Use Guidelines" (IPD Agreement, p.13).
>
> "MOB IPD Team Contingency" shall equal Nine Hundred Seventy-Five Thousand Seven Hundred Eighty-Six Dollars ($975,786). The MOB IPD Team Contingency shall be outside of the MOB GMP (IPD Agreement, p.4).
>
> "'Owner A' Improvements IPD Team Contingency: Four Million Seven Hundred Eighty-One Thousand Seven Hundred Eighty-Eight Dollars ($4,781,788). The 'Owner A' Improvements IPD Team Contingency shall be outside of the 'Owner A' Improvements GMP (IPD Agreement, p.6).

- *Contractor's Contingency*

  "The Contractor's Contingency is intended to protect Contractor against the risks assumed in providing a Construction GMP for the project. Owner acknowledges and agrees that the cost estimating process is not exact. Therefore, the Contractor's Contingency is included to adjust the estimate for quantity and price estimating accuracies, and other eventualities which have not been taken into precise account in the establishment of the Construction GMP, including but not limited to: (a) unfavorable bidding from trade contractors due to market conditions, price increases, lack of competition, and other variables; (b) default in payment of performance by a subcontractor or supplier; (c) cost of corrective work not provided for elsewhere; and (d) other conditions which result in an increase of the Cost of the Contractor's Work without increasing the Construction GMP" ('Owner A' Contractor Construction Agreement, 2010, p.11).

  "Construction Contingencies shall mean, collectively, the 'Owner A' Improvements Construction Contingency and the MOB Construction Contingency" (IPD Agreement, P.3).

  "MOB Construction Contingency: Four Hundred Eighty-seven Thousand Eight Hundred Ninety-Three Dollars ($487,893). The MOB Construction Contingency shall be within the MOB GMP" (IPD Agreement, P.4).

  "'Owner A' Improvements Construction Contingency: Two Million Three Hundred Ninety Thousand Eight Hundred Ninety-Four Dollars ($2,390,894). The 'Owner A' Improvements Construction Contingency shall be within the 'Owner A' Improvements GMP" (IPD Agreement, p.5).

- *Design and Estimating Contingencies*

  "Design and Estimating Contingencies shall mean, collectively, (i) the MOB Design and Estimating Contingency and (ii) the 'Owner A' Improvements Design and Estimating Contingency" (IPD Agreement, P.3).

  "MOB Design and Estimating Contingency: Six Hundred Fifty Thousand Six Hundred Fifty-Two Dollars ($650,652)" (IPD Agreement, P.3).

  "'Owner A' Improvements Design and Estimating Contingency: Three Million One Hundred Eighty-Seven Thousand Eight Hundred Fifty-Nine Dollars ($3,187,859)" (IPD Agreement, P.5).

"The 'Owner A' Improvements Design and Estimating Contingencies shall be funded by 'Owner A', and the MOB Design and Estimating Contingency shall be funded by Owner B" (IPD Agreement, p.12).

"Return of Design and Estimating Contingencies. Upon agreement by Owner A or Owner B, as applicable, and Contractor as to the final GMP based upon one hundred percent (100%)-approved construction documents under the ' Owner A' Improvements Construction Agreement or MOB Construction Agreement, as the case may be, all amounts remaining in each of the Design and Estimating Contingencies shall be returned to Owner A and/or Owner B, as the case may be, and each of the ' Owner A' Improvements GMP and MOB GMP shall be reduced by Change Order in accordance with the terms of the ' Owner A' Improvements Construction Agreement or MOB Construction Agreement, as the case may be" (IPD Agreement, p.13).

- *Owner Contingency*

"Owner Contingencies shall mean, collectively, (i) the Owner B's Contingency and (ii) the ' Owner A' Contingency" (IPD Agreement, p.5).

"Owner B's Contingency: a contingency held by Owner B outside of the MOB GMP" (IPD Agreement, p.4).

7.3.3.2 **Insurance**

The insurance policy in this project is similar to the insurance policy traditionally used for conventional delivery methods (Contractor).

- *Owner's Insurance*

The Owner shall be responsible for purchasing and maintaining Owner's liability insurance covering Owner's obligations. Owner's liability insurance shall name the Architect as a named insured (MOB General Conditions, p.38). Below is the list of Owner's insurance coverages:

1) *Commercial General Liability*
2) *Automobile Liability - Any Auto (including Hired and Non-Owned Autos)*
3) *Statutory Worker's Compensation and Employers Liability*
4) *Excess Liability - Umbrella Form (MOB Conditions, Exhibit 2).*

"Owner shall purchase and maintain property insurance and/or builder's risk insurance in the mount of construction GMP for the entire work as well as materials stored for the project. In addition to the interests of Owner, this insurance shall include the interests of the Contractors and Subcontractors of every tier as named insured under this policy (MOB General Conditions, p.38).

- *Contractor's Insurance*

The GC shall purchase insurance that will protect the GC from claims that may result from GC's operations under the Construction Agreement for which the GC may be legally liable. Claims may fall in to the following categories: 1. Workers' compensation, 2. Claims for damage because of bodily injury, death, etc., 3. Claims for damages insured by personal injury liability coverage, 4. Claims for property damages, 5. Claims involving Contractor's liability insurance. (MOB General Conditions, p.36).

Contractor's insurance overages include:

1. *Commercial general liability insurance*
2. *Automobile liability insurance*
3. *Worker's compensation and employer's liability insurance*
4. *Excess liability insurance*

Additional insured: The Owner A, the Project Manager, Architect, and their respective officers, agents, employees, successors shall be named as additional insureds on coverages 1,2, and 4 (MOB General Conditions, Exhibit 1).

- *Subcontractor's Insurance*

"Contractor shall cause each Subcontractor to (1) procure insurance reasonably satisfactory to Owner, and (2) name Contractor, each member of Owner Team and Architect as additional insureds under the Subcontractor's comprehensive general liability policy. The additional insured endorsement included on the Subcontractor's commercial general liability policy shall state that coverage is afforded the additional insureds with respect to claims arising out of operations performed by or on behalf of the Subcontractor. If the additional insureds have other insurance which is applicable to the Project, such other insurance shall be, for the purposes hereof, on an excess or contingent basis. The amount of the insurer's liability under this insurance policy shall not be reduced by the existence of such other insurance" (MOB General Conditions, p.38).

- *Architect's Insurance*

  "Architect shall be responsible for purchasing and maintaining the insurance and the bonds" (Owner A-Architect Design Agreement, 2010, pp.7-8).

  "Architect shall maintain, throughout the Project and for a period of three (3) years thereafter, a standard form of errors and omissions insurance with an insurance company satisfactory to Owner. Architect shall also maintain insurance coverage for comprehensive general liability, automobile liability and workers' compensation in forms and amounts satisfactory to Owner, and such policies shall name Owner as named insured parties. Architect shall assure that any and all consultants engaged or employed by Architect carry and maintain similar insurance with reasonably prudent limits and coverages in light of the services to be rendered by such consultants" (MOB General Conditions, p.40).

Architect's insurance overages include:

1) *Commercial General liability*
2) *Automobile liability*
3) *Workers' compensation*
4) *Excess liability*
5) *Professional liability: Errors and omissions insurance*

Additional insureds: the Owner A, the Project Manager and the GC and their respective officers, agents, employees, successors shall be named as additional insureds on coverages 1, 2 and 4 (MOB General Conditions, Exhibit 3).

7.3.3.3 **At-Risk Amount**

"If (i) there are 'Owner A' Improvements/ MOB IPD Team Costs in excess of the 'Owner A' Improvements /MOB IPD Team Contingency, or (ii) the actual 'Owner A' Improvements/MOB Construction Costs exceed the then 'Owner A' Improvements/MOB GMP, such excess costs shall be considered "'Owner A' Improvements/MOB Excess Costs". Contractor, Architect and Owner shall pay such 'Owner A' Improvements/MOB Excess Costs out of their respective 'Owner A' Improvements/MOB At Risk Amounts in proportion to the then-existing dollar amounts of their respective 'Owner A' Improvements/MOB At Risk Amounts, until their respective 'Owner A' Improvements/MOB At Risk Amounts are exhausted" (IPD Agreement, p.16).

- *Contractor's At-Risk Amount*

  "Contractor agrees that, Contractor may have to pay certain Project costs associated with the 'Owner A' Improvements/MOB that would otherwise be the Owner's or Architect's responsibility up to a maximum of the Contractor's 'Owner A' Improvements/MOB At-Risk Amount" (IPD Agreement, p.14).

  "Contractor's MOB At Risk Amount: Three Hundred Eighty-Seven Thousand Nine Hundred Two and No/100 Dollars ($387,902.00)" (IPD Agreement, p.3).

  "Contractor's 'Owner A' Improvements At Risk Amount" shall mean One Million Seven Hundred Eighty-Seven Thousand Six Hundred Fifty-Eight and No/100 Dollars ($1,787,658.00)" (IPD Agreement, p.3).

  "Retainage. Contractor agrees that 'Owner A'/ Owner B may apply the retainage withheld under the 'Owner A' Improvements/MOB Construction Agreement to satisfy Contractor's obligations to pay Contractor's 'Owner A' Improvements/MOB At Risk Amount under this Agreement and, to the extent such retainage is so applied, such applied retainage shall be deemed to have been released to Contractor and expended on Contractor's behalf" (IPD Agreement, p.14).

- *Architect's At-Risk Amount*

  "Architect agrees that, Architect may have to pay certain Project costs associated with the 'Owner A' Improvements/MOB that would otherwise be the Owner's or Contractor's responsibility up to a maximum of the Architect's 'Owner A' Improvements/MOB At-Risk Amount" (IPD Agreement, pp. 14-15).

  "Retainage- To partially ensure adequate funding of the Architect's 'Owner A' Improvements/MOB At-Risk Amount, Owner A/MOB Owner shall have the right to retain from the Architect's 'Owner A' Improvements/MOB Fee, on a monthly basis commencing upon the Effective Date, an amount equal to (a) twenty-five percent (25%) of the Architect's 'Owner A' Improvements/MOB At-Risk Amount divided by (b) the number of calendar months occurring from the Effective Date to the scheduled Substantial completion date of the 'Owner A' Improvements/MOB as determined in accordance with the 'Owner A' Improvements/MOB Construction Agreement" (IPD Agreement, p. 15).

"Architect agrees that an Owner may apply the fees withheld to satisfy Architect's obligations to pay Architect's 'Owner A' Improvements or MOB At Risk Amount under this Agreement and, to the extent such withheld fees are so applied, such applied fees shall be deemed to have been paid to Architect and expended on Architect's behalf" (IPD Agreement, p.15).

- *Owner's At-Risk Amount*

"Owner A/ Owner B agrees that, Owner A/ Owner B may have to pay certain Project costs associated with the 'Owner A' Improvements/MOB that would otherwise be the Architect's or Contractor's responsibility up to a maximum of the 'Owner A' Improvements/MOB At-Risk Amount" (IPD Agreement, p.16).

"Owner B's MOB At Risk Amount" shall mean the lesser of (i) the unused MOB Design and Estimating Contingency returned to the Owner B pursuant to Section 4.1.3 below, or (ii) Five Hundred Thirty-Nine Thousand Seven Hundred Ninety-Nine and 00/100 Dollars ($539,799.00); except that if such At Risk Amount is less than $539,799.00, Owner B shall have the option, to be exercised in its sole discretion by written notice to the other IPD Team Members, to increase the At Risk Amount for which Owner B will be liable to a higher amount, as long as such higher amount does not exceed the fixed dollar amount specified in clause (ii) above" (IPD Agreement, pp 4-5).

"'Owner A' Improvements At Risk Amount shall mean the lesser of (i) the unused 'Owner A' Improvements Design and Estimating Contingency returned to Owner A pursuant to Section 4.1.3 below, or (ii) Two Million Three Hundred Thirty-Eight Thousand Nine Hundred Eighty-Eight and 00/100 Dollars ($2,338,988.00); except that if such At Risk Amount is less than $2,338,998.00, Owner A shall have the option, to be exercised in its sole discretion, by written notice to the other IPD Team Members, to increase the At Risk Amount for which Owner A will be liable to a higher amount, as long as such higher amount does not exceed the fixed dollar amount specified in clause (ii) above" (IPD Agreement, p.6).

7.3.3.4 **Waivers**

- *Waivers of Subrogation*

"Owner, Architect and Contractor waive all rights against each other and any of their subcontractors and all other project participants for damages caused by fire and other perils to the extent covered by property insurance" (MOB General Conditions, p.39).

7.3.3.5 **Indemnification**

"To the fullest extent permitted by law, Owner shall indemnify and hold harmless Contractor, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material is a Hazardous Substance and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom ("Hazardous Material Claim"). Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Subparagraph 11.1.4. Notwithstanding the foregoing, if Hazardous Material Claims are caused or alleged to be caused in part by any joint or concurrent negligent act (either active or passive) or omission by any of the indemnified parties, Owner shall indemnify, hold harmless and defend the indemnified parties from such Hazardous Material Claims only to the extent such Hazardous Material Claims arise out of or result from the negligence or willful misconduct of the Owner Team and only in proportion to the negligence of the Owner Team. In no event shall Owner be obligated to indemnify the indemnified parties for Hazardous Material Claims which arise out of or result from the sole negligence or willful misconduct of the indemnified parties or their agents, servants or independent contractors" (General Condition, p.35).

7.3.3.6 **Warranty**

"Contractor represents and warrants to Owner and Architect that: (1) materials and equipment furnished under the Contract Documents will be of good quality and new unless otherwise required or permitted by the Contract Documents; (2) the Work will be free from defects not inherent in the quality required or permitted; and (3) the Work will conform with the requirements of the Contract Documents" (General Conditions, p.9).

7.3.3.7 **Dispute Resolution**

"The Parties shall develop protocols by which Project issues shall be raised and reviewed by the Project Executive Team and Core IPD Team. Such protocols shall include, but not be limited to, any notice requirements for raising matters to be addressed, required supporting documentation, and time frames within which team members must render a decision. The Parties shall endeavor to resolve all Project issues through direct discussions at meetings of the Core IPD Team. Issues

not resolved by the Core IPD Team may be submitted by any Party's representative to the Project Executive Team. Issues that are not resolved by the Project Executive Team may be referred by any Party's Project Executive Team Representative for resolution under Article 7 of this Agreement" (IPD Agreement, p.9).

- *Senior officers of IPD team*

  "Upon the request of any member of the Project Executive Team, a claim or dispute may be submitted to the Dispute Resolution Procedures set forth in this Exhibit E. Upon such request, "Senior Officers" of each member of the IPD Team shall meet, as soon as conveniently possible, but in no case later than ten (10) calendar days after such a request is made, to attempt to resolve such claim" (IPD Agreement, Exhibit E).

- *Mediation*

  "If such meeting is not successful, then either party may, by written notice to the other party, demand mediation of the Conflict. The parties shall first attempt in good faith to agree upon a single mediator" (IPD Agreement, Exhibit E).

- *Litigation*

  "If a claim has not been resolved within seventy-five (75) calendar days after the initial meeting of the Project Executive Team to resolve the issue, then any Party shall have the right to commence litigation. Nothing in this Exhibit E is intended to preclude the parties from agreeing to use arbitration to resolve any dispute that was not resolved through mediation" (IPD Agreement, Exhibit E).

7.3.4 Incentives

Table 7-10 illustrates incentives criteria, sources of funding, and their allocation among the team "PROJECT TWO".

Table 7-10: Incentives in "PROJECT TWO"

Incentive Criteria	Source of funding	Distribution of incentive		
		Owner	Architect	GC
• Staying within budget and saving IPD team contingency	Reduction in the project's costs	X		
	Shared IPD team contingency preservation	X	X	X

"Upon Final Completion of the 'Owner A' Improvements/MOB, the Core IPD Team shall meet and determine the remaining balance, if any, of the 'Owner A' Improvements/MOB IPD Team Contingency and also to determine whether there are any 'Owner A' Improvements/MOB Savings, as defined below" (IPD Agreement, p.16).

7.3.4.1 **Replenishment of Project Savings**

"'Owner A' Improvements/MOB Savings mean the amount, if any, by which the final sum of the Cost of the Contractor's Work and Contractor's Fee under this Construction Agreement, is less than the then 'Owner A' Improvements/MOB GMP.

Upon final completion and acceptance of the Work, Savings, if any, shall be allocated: (i) first, to fund any required cross allocation of Project-Wide Savings; (ii) second, to fund the Warranty Work Set Aside; and (iii) third, to the extent there are any remaining Savings, the saving is allocated according to IPD team bonuses" (Owner A-Contractor Construction Agreement, 2010, p.7).

- *Cross Allocation of Project-Wide Savings*

"Notwithstanding anything to the contrary contained in this Construction Agreement or the Owner B Construction Contract, in the event that there are Savings under one of, but not both, of this Construction Contract and the Owner B Construction Contract ("Project-Wide Savings"), and there are Costs of Contractor's Work in excess of the applicable Construction GMP or the Owner B GMP under the other such contract ("Specific Contract Overrun"), such Savings shall be applied towards such Specific Contract Overrun until the Project-Wide Savings are depleted. If the Project-Wide Savings exceed the amount of the Specific Contract Overruns, the remaining Project-Wide Savings shall inure to the benefit of the owner under whose construction contract the Project-Wide Savings were generated" (Owner A-Contractor Construction Agreement, pp.7-8).

- *Costs of Correction*

"If, after final completion and acceptance of the all of the Campus Improvements, it is determined that Savings exist, then, an amount equal up to one-tenth of one percent (0.10%) of the Construction GMP will be funded by the Owner out of such Savings in a set aside account to cover the cost of any warranty or corrective Work that Contractor performs on the Project (but not the other Campus Improvements) during the one (1)-year period after Substantial Completion

(the "Warranty Work Set Aside"). Prior to undertaking any warranty or corrective Work, Contractor shall notify Owner and Owner reserves the right to undertake such warranty or corrective Work. Contractor shall in good faith pursue any rights and remedies against subcontractors for any warranty or corrective work that may arise. If, subsequent to final payment and at Owner's request, Contractor incurs costs: (a) to correct nonconforming Contractor's Work; or (2) arising from the resolution of disputes related to warranty or corrective work, Contractor shall be entitled to apply the funds, if any, in the Warranty Work Set Aside towards those costs. The Warranty Work Set Aside, once released to Contractor, constitutes full and final consideration for any and all warranty or corrective work that Contractor may be obligated to perform under this Construction Agreement or the other Contract Documents. Any balance of the Warranty Work Set Aside remaining upon expiration of the one (1)-year period after Substantial Completion of all the Campus Improvements shall be returned to Owner"(Owner A-Contractor Construction Agreement, pp.7-8).

- *IPD Team Bonuses*

"Subject to the prior allocations pursuant to Section 1.9 of the 'Owner A' Improvements/MOB Construction Agreements, to the extent there are 'Owner A' Improvements/MOB Savings, upon approval of the Project Executive Team, fifty percent (50%) of such 'Owner A' Improvements/MOB Savings shall be made available: (i) first, to reimburse Owner, Architect and Contractor for any amounts previously paid pursuant to Section 5.4.1 (At-Risk amounts), and (ii) to replenish the 'Owner A' Improvements/MOB IPD Team Contingency, but in no event shall the 'Owner A' Improvements/MOB IPD Team Contingency be increased to an amount greater than the initial amount of such Contingency. Except as may be allocated above in these Section 6.1.1&2, all 'Owner A' Improvements/MOB Savings shall belong solely to Owner A/ Owner B" (IPD Agreement, p.17).

- *GMP Savings*

"Except indirectly through the IPD Agreement and Contractor's participation thereunder in any remaining funds in the IPD Team Contingency, Contractor shall not be entitled to share in any Savings. Contractor agrees that, in the event the Construction GMP is in excess of the Cost of the Contractor's Work and the Contractor's Fee after the time of final payment (and except as provided in Paragraph 8.3.5 of this Construction Agreement), Contractor shall issue a deductive change order to the Construction GMP reducing the Construction GMP by the amount of the Savings allocated to Owner" (Owner A-Contractor Construction Agreement, 2010, p.12).

- *PM's Bonus*

The Owner B/PM is essentially at risk for the adequacy of the service and performance. The Owner A expects the PM to deliver the project on time and under budget. In fact, as part of the agreement between the Owner and the PM, there is an incentive bonus payment equal to one month professional project management fee at the discretion of the Owner to pay, if the PM delivers the project on time and under budget (Owner B/PM).

7.3.4.2 **Replenishment of IPD Team Contingencies**

"Upon Final Completion of the Owner A/ Owner B Improvements and approval of the Project Executive Team, Owner A/ Owner B shall distribute and/or retain, as applicable, the then-existing Owner A/ Owner B Improvements IPD Team Contingency to Contractor ("Contractor's 'Owner A' Improvements/MOB IPD Bonus"), Architect ("Architect's 'Owner A' Improvements/MOB IPD Bonus") and Owner A/ Owner B in proportion to the then existing dollar amounts of their respective 'Owner A' Improvements/MOB At Risk Amounts, up to a maximum of their respective 'Owner A' Improvements/MOB At Risk Amounts" (IPD Agreement, p.17).

7.3.5 **Process Management**

"The Project Executive Team shall make decisions as well as plan and manage the Project in such a manner as to allow the Parties to achieve the Project goals and successfully complete the Project. The Project Executive Team shall meet monthly with the Core IPD Team to review Project progress, Project goals, expenditures of Project Contingencies and any other issues raised by the Core IPD Team. The Project Executive Team shall exercise its authority in the best interests of the Project" (IPD Agreement, p.8).

"The Project Executive Team shall decide and control all expenditures of the Project Contingencies in accordance with the Contingency Use Guidelines" (IPD agreement, p.8).

"The Core IPD Team is responsible for executing the decisions and directives of the Project Executive Team. The Core IPD Team shall meet weekly to review job progress, review and resolve issues and claims, review and allocate cost issues among the various parties and Project Contingencies and review and evaluate performance of the Parties. The Core IPD Team shall be responsible for the day-to-day management of the Project, including the scheduling and coordination of the Parties' activities required to complete the Project in a collaborative and integrated manner. The Core IPD Team is responsible for establishing the procedures and

processes necessary to achieve Project goals including such protocols and understandings as are necessary to implement collaborative technologies, such as Building Information Modeling" (IPD agreement, p.8).

Table 7-11: Process management in "PROJECT TWO"

Process Management	
Process Management	Value Analysis & Engineering Services provided by the IPD team
	Constructability

7.3.5.1 **Pre-construction**

- *Value Analysis Strategy*

  "Throughout the Design and Construction Phases, the IPD Team shall continuously pursue opportunities to create additional value by identifying options to reduce capital or life cycle cost, improve constructability and functionality, or provide operational flexibility, while satisfying Owner's programmatic needs. In order to avoid waste associated with re-drawing aspects of the Work, extensive value analysis and identifying opportunities for set-based design (carrying multiple design options forward and deferring decisions until the last responsible moment) must be emphasized early in the design process. In order for these efforts to be effective, the project must gain the early involvement of the subcontractors and sub-consultants who possess information essential to the value engineering process. The IPD Team and its subcontractors and subconsultants shall be encouraged to bring forward within the cross-functional teams of builders and designers, alternative systems, means, methods, configurations, site locations, finishes, equipment and the like that satisfy the general design criteria of the Project, but which result in savings of time or money in constructing or operating and maintaining the Project, or increasing quality, constructability, or other measures of value ("VE Proposal"). Each VE Proposal shall examine the proposed change, identify all aspects of the Project directly or indirectly affected by the change, specify the cost or time savings to be achieved if the VE Proposal is accepted, and detail any anticipated effect on the Project's service life, economy of operation, ease of maintenance, appearance, design or safety standards. Cross-functional teams shall initially review and consider whether to incorporate a VE Proposal in the Project. In case of disagreement concerning whether to accept a proposal, the Core Team shall determine which proposals to pursue" (IPD Agreement, pp. 10-11).

- *Constructability*

  "The IPD Team and its subcontractors and subconsultants shall be encouraged continually review the Design Documents for clarity, consistency, constructability and coordination among the design disciplines' drawings and the construction trades and collaborate with the IPD Team in developing solutions to any identified issues. The purpose of constructability review is to determine that the design is progressing in a manner that will result in complete, accurate and coordinated set of Design Documents which is sufficiently complete and coordinated for construction, and thereby reduce the risk of disruption, delay, change orders and potential claims" (IPD Agreement, p.11).

- *RFI*

  "The goal of this Agreement is to maximize the parties understanding of the design requirements, including the design intent and all technical requirements of the Project, prior to field construction. If the parties have maximized this opportunity, there will be very few RFIs or clarifications after construction is commenced. To the extent that the need for clarification does arise, the party seeking clarification should first raise the issue either in a face-to-face conversation or via telephone in accordance with the Project communication protocols. The initial conversation shall describe the issue, identify the area affected, and request the clarification needed. If the parties to that conversation are able to resolve the issue in the course of that conversation, they shall also agree on how the clarification shall be documented and reported to the Core IPD Team. If the parties to that conversation are not able to resolve the issue in the course of that conversation, they shall agree on how the issue will be resolved (who, will do what, by when) and shall agree which of them will notify the Core IPD Team concerning the issue and how they plan to resolve it. It is this Agreement's goal that RFI's will only be issued to document solutions, rather than raise questions that have not previously been the subject of a conversation. To the extent that resolution of the issue may affect progress of the Work, the issue shall be included in the planning system. During construction, the Core IPD Team may set daily or weekly meetings of all parties necessary for concurrent resolution of RFI's" (IPD Agreement, p.11).

7.4 IPD Principles

"The Parties agree to form an IPD Team to facilitate design, construction and commissioning of the Project. The team members shall openly share information and cooperatively collaborate for the benefit of the Project. By forming an Integrated Team, the Parties intend to gain the benefit of an open and creative learning environment, where team members are encouraged to share ideas freely in an atmosphere of mutual respect and tolerance.

Team members shall work together and individually to achieve transparent and cooperative exchange of information in all matters relating to the Project and to share ideas for improving Project delivery. Team members shall actively promote harmony, collaboration and cooperation among all entities performing on the Project" (IPD Agreement, p. 7).

"A primary responsibility of each Party is to communicate to its employees the importance of adhering to "Integrated Project Delivery" principles and to provide training and guidance as necessary. The Core IPD Team shall assist the Parties in these efforts and shall be responsible for monitoring training for the employees of key Project participants focused on Integrated Project Delivery principles" (IPD Agreement, p.9).

The following chart represents the IPD principles and characteristics that are implemented in this project. The chart is taken from chapter 3 of this dissertation, and it is the result of literature review and analysis on the qualities defining IPD characteristics. A check mark (√) indicates the principles which are applied and an (X) indicates the ones which are not applied in this project (Table 7-12).

Table 7-12: IPD principles and characteristics applied in "PROJECT TWO"

IPD Principles and Characteristics		
Contractual Principles of IPD	Shared financial risk and reward	√
	Liability waivers between key participants	X
	Fiscal transparency between Owner and the Contracting party	√
	Early involvement of key participants	√
	Intensified early planning	√
	Jointly developed project target criteria	√
	Collaborative decision making and control	√
Behavioral Principles of IPD	Mutual respect and trust	√
	Willingness to collaborate	√
	Open communication/Information sharing	√
	Collaborative innovation	√
	Reliable promising	√
	Acting in the best interest of the project	√
Relational Contract Type	Multiple two party +IPD agreement	√
Catalyst to IPD	Lean techniques	X
	BIM	√
	Colocation of the team	√
	Organization & leadership	√

7.4.1 Contractual Principles of IPD Applied in "PROJECT TWO"

A few contractual principles are further explained below.

7.4.1.1 Fiscal transparency to the Owner

There was an open book between the Owner and each of the project participants. However, the project participants did not have an open book among each other (Contractor & Owner/PM).

> "Owner shall have the right, during the term of this Construction Agreement and for a period of three (3)years after Final Payment is made hereunder, to audit Contractor's records, books, correspondence, instructions, drawings, receipts, subcontracts, purchase orders, vouchers, memoranda, and other data relating to the Contractor's Work, the Cost of the Contractor's Work, this Construction Agreement, the Construction GMP, and/or the Project generally. In addition to

the records referred to in this Paragraph, Owner shall be afforded reasonable access to all documents reasonably necessary to perform a full, complete and accurate audit consistent with the terms of the Contract Documents" (Owner A-Contractor Construction Agreement, 2010).

"Architect shall keep and maintain all books and records pertaining to the Project in accordance with generally accepted accounting principles for a period of six (6) years after Architect's issuance of certificate for final payment, and after and all other pending matters concerning this Design Services Agreement have been closed, whichever is later. Records, books, correspondence, instructions, drawings, receipts, subcontracts, purchase orders, vouchers, memoranda and other data relating to the Project (together the "**Records**") shall be kept on the basis of generally accepted accounting principles and shall be available for inspection and review by Owner or Owner's authorized representative at mutually convenient times. All Records which may have a bearing on matters of interest to Owner in connection with the Architect's services shall be open to inspection and subject to audit and/or reproduction by Owner or Owner's authorized representative to the extent necessary to adequately permit evaluation and verification of Architect's compliance with Design Services Agreement requirements (such as with provisions for invoicing, Supplemental Services, and/or claims), and to allow Owner to adequately respond to requests for information from third parties (such as governmental authorities)" (Owner A-Architect Design Agreement, 2010, p.8).

7.4.1.2 **Early involvement**

"Architect acknowledges that Owner desires Contractor to be a full participant with respect to the overall concept and functionality of the Project, and with respect to providing input into the design of the Project. Accordingly, Contractor may be involved during Architect's Preliminary Design Services to provide cost estimating services, value engineering and other services on Owner's behalf" (Owner A-Architect Design Agreement, 2010, p.8).

The IPD team adds that historically, in the project site location, most work is done in an integrated manner but without implementing a formal IPD agreement (Architect/Contractor/Project Manager).

7.4.1.3 **Collaborative decision making**

"The Project Executive Team shall decide and control all expenditures of the Project Contingencies in accordance with the Contingency Use Guidelines" (IPD agreement, p.8).

"Decisions by the Project Executive Team shall be by consensus, with each member of the Project Executive Team allocated one vote each for purposes of decision making. The Parties

agree to be bound by any decision rendered by the Project Executive Team. In the event a decision is not reached by consensus, then the Project Executive Team shall submit the matter to the dispute resolution process set forth in Article 7 of this Agreement" (IPD agreement, p.8).

"Decisions by the Core IPD Team shall be by consensus, with each member of the Core IPD Team allocated one vote each for purposes of decision making. Subject to a subsequent decision by the Project Executive Team and the Dispute Resolution Committee, the Parties agree to be bound by any decision rendered by the Core IPD Team. If the Core IPD Team representatives are unable to reach a decision on a matter, any Party's representative may refer the matter to the Project Executive Team for decision" (IPD agreement, pp.8-9).

Even though the decision making was highly collaborative, in the end the Owner has the biggest vote and final say (Architect & Project Manager).

The Owner has the sole authority to change the project scope; in fact the Owner has made some unilateral decisions about the project scope. However, he is not much involved in day- to- day decision making by the IPD Core Team.

7.4.1.1 Shared risks and rewards

The architect's major sub-consultants, such as structural, mechanical, and electrical participated in the shared risks and rewards pool through signing an addendum to their contract with the architect (Architect).

7.4.2 Behavioral Principles of IPD Applied in "PROJECT TWO"

Through signing the joining agreement, the contracting parties acknowledge their commitments to the IPD behavioral principles. A few of the IPD behavioral principles are further explained below. The following citation is from the IFOA and is signed by the IPD Core Team:

7.4.2.1 Mutual Respect and Trust/ Collaboration

"The Parties accept the relationship of mutual trust and confidence established with each other by this Agreement, and promise to furnish their professional skill and judgment and to collaborate and cooperate with each other and with other project participants in actively pursuing an integrated project and furthering the interests of the Project" (IPD Agreement, p.7).

7.4.2.1 **Reliable Promising**

"Fundamental to the success of the Project is the willingness and ability of the IPD Team Members to make and secure reliable promises as the basis for planning and executing the Project" (IPD Agreement, p.10).

7.4.2.2 **Open communication/ Information sharing**

"The Core IPD Team and the Project Executive Team agree to contribute their knowledge, skill and services during all phases of the Project and to bring to bear their expertise for the overall benefit of the Project" (IPD Agreement, p.7).

"The Parties acknowledge that timely sharing of relevant Project information among the Parties and, when relevant and applicable, among other Project participants, is important to the success of the Project. Accordingly, communications for purposes of sharing such information are not based on a contractual hierarchy, and team members, their consultants, subcontractors, advisors, and agents are encouraged to share information directly with one another" (IPD Agreement, p.9).

Besides the daily interaction between the Owner, the Architect, and the GC, there are different series of meetings:

1. *Design meetings which were held once a week during the design phase; in these meetings the GC and the Owner reviewed the work of the Architect which had been produced during the previous week.*

2. *OAC coordination meetings which were held every week (PM/O/GC). The participants in the OAC meetings include the Owner, the Architect, the GC, and all the Subcontractors. The OAC meetings replaced the design meetings during construction (Architect). In this meeting the participants would first discuss the old business items from prior meetings, and then any new business items forthcoming. Topics of discussion generally include overall day- to- day status of the project, technical issues, schedule update, safety, upcoming potential changes by the Owner, submittals, and RFI's (Owner, GC).*

3. *IPD Core Team meetings weekly (PM; Owner): The participants of the IPD Core Team meetings include a representative from the Owner, the Architect, and the GC (Contractor). In the IPD Core Team meetings topics of discussion include the status of the project, any issues such as change request, RFI's, predicted cost overrun, delays, and the ways to address the issues (Owner). Mostly the team discusses the changes and determines the specific contingency bucket for financing those changes (Contractor).*

4. *IPD Senior Group meetings which are held once a month (PM/O; Owner). The IPD Senior Group reviews the summary of discussions took place in the IPD Core Team meetings, and works on issues that the IPD Core Team meetings was unable to solve (Owner). According to the GC, half of these meetings have been cancelled because there have not been issues left for them to address, as the IPD Core Team have successfully addressed all issues. Generally, the topics of discussion in the IPD Senior Group meeting include the current status of the project, areas of concern, the project schedule and completions, and contingency allocation (PM/Owner; Contractor). As an example in this project, there were some issues related to timing and payments. The process by which the contractors' payments were approved has been a laborious process, and in some circumstances the contractors were not getting paid early enough to meet their payrolls. So that becomes a subject of discussion in the IPD meeting (PM/Owner).*

7.4.2.3 **Acting in the best interest of the project**

"The Parties recognize that each of their opportunities to succeed on the Project is directly tied to the performance of other Project participants. The Parties shall therefore work together in the spirit of cooperation, collaboration, and mutual respect for the benefit of the Project, and within the limits of their professional expertise and abilities. Throughout the Project, the Parties shall use their professional efforts to perform the work in an expeditious and economical manner consistent with the interests of project" (IPD Agreement, p.7).

7.4.2.4 **Collaborative innovation**

An example of innovation in this project is the idea of prefabrication of many repetitive components in the building, as in this project 75 rooms are identical. Many of the pieces such as walls, plumbing, and top roof air handling units were pre-fabricated and then brought to the site and installed. The prefabrication idea saved time (Owner/PM).

7.4.3 **IPD Catalyst Applied in "PROJECT TWO"**

7.4.3.1 **Lean strategies**

Lean principles were only implemented to some extent. The team did not get too formal about it . The lean principle of acting in the last responsible moment is followed in this project (Owner/PM).

7.4.3.2 **BIM**

"The Parties agree, where practicable, to employ collaborative technologies such as Building Information Modeling (BIM) and digital collaboration tools" (IPD Agreement, p.7).

The BIM technologies were not used to their full advantage. The design team built the architectural model; however, the GC did not use the Architect's model for MEP coordination. Instead the contractor chose to use the steel supplier's model developed in XSteel program because the steel supplier developed the model by zone and how the contractor is going to erect the steel. Thus, it was more efficient for the GC to use the model for the purpose of scheduling and sequencing. The contractor then turned in the structure model to the Mechanical contractor who takes the lead on MEP coordination. The MEP contractor built the mechanical and HVAC system model. They took the electrical model provided by the electrical subcontractor and the fire protection model by the subcontractor, and subsequently built an integrated MEP model in Revit. In the end, the General Contractor took the MEP model in Revit and performed a clash detection using Navis Works (Contractor).

7.4.3.3 **Co-location of the team**

The Architect's construction administration office is located on project site in the GC's trailer. As a result the Owner, the Architect, and the GC had the benefits of daily interaction with each other (Architect).

7.5 Comparative Analysis of IPD and a Traditional Delivery Approach

Through the open-ended questionnaire, the key IPD players were asked to reflect on their experience with the IPD approach; and to discuss how the IPD has changed the way they used to carry out a similar project in a a traditional delivery setting; and how their responsibilities, liabilities, and risk exposure have changed in IPD. Below is the result of the IPD team responses.

7.5.1 Changes in Roles and Responsibilities of Participants

- *In addition to the traditional roles and responsibilities, parties are responsible for management of shared contingency*

In "PROJECT TWO" the decision to go with IPD approach was made after virtually all the contract have been executed between the Owner and the Architect, the Owner and the GC, and between the two Owners.

So, the IPD agreement is a bridging document and is really considered an overlay on top of the existing two-party agreements to the extent that each of the parties has skin in the game. (Owner/PM and Architect). As a result, the primary role and responsibilities of the parties is similar to their conventional roles and responsibilities (Architect).

Compared to a traditional delivery approach, however, there is an additional layer of responsibility that each party has, such as shared contingency management (Project Manager).

7.5.2 Changes in Liabilities

- *Shared liability for design errors and cost overrun being financed through shared IPD contingency and At-Risk Dollars*

In IPD setting, some risks are shared by the IPD Core Team (Owner, Architect, Contractor) and financed through a shared IPD contingency. The shared risks in this case study are: risks of cost overrun and risk of design error and omissions.

Every party in the IPD agreement has skin in the game. Everyone has some at risk dollars in the IPD program. The Contractor and the Architect have some at risk fees and there is a pool of potential bonuses

at the end of the project funded by the owner. Thus there is at risk dollars plus benefit incentive if the team ends the project on time and under budget.

Some risks that are traditionally the Owner's responsibility and applicable to the Owner contingency; in an IPD arrangement fall under IPD contingency and is shared among IPD members. As a result, if IPD contingency runs out in the project, the Owner and other IPD members collectively are responsible for cost overrun applicable to the IPD contingency. The IPD team members would risk their fee if IPD contingency runs out (Contractor). In this IPD project everybody has a little more risk, but since the risks are shared, everyone is aligned to minimize those risks (Owner/PM and Owner).

- *Shared liabilities for design errors and omissions*

Traditionally, the design errors and omissions caused by the Architect, if not covered by the Architect's insurance, is the responsibility of the Architect to pay. Often, the Architects would be protective against these liabilities and thus issues would lead to an adversarial finger pointing situation. As a result, we often see that in a traditional setting much time and resources would be spent by each party to protect themselves and their individual interest against potential liabilities.

Comparatively, the IPD arrangement promotes individuals' alignment towards the best interest of the project. IPD incentivizes and motivates the parties to collaboratively identify potential issues and solve the problems. Furthermore, the presence of the IPD contingency avoids such an adversarial situation we often face when a design errors and omission poses some difficulty in the process. The IPD contingency could be spent to address the issue as opposed to fighting over who is responsible for covering the cost (Owner/PM).

The Architect would benefit from the Contractor's cooperation and collaboration during the design phase. As a result, the Architect is less likely to point blame and ask for additional fees if something goes wrong (Architect).

- *Shared liabilities for cost overrun*

In a traditional GMP-based contract, the risk of cost overrun is generally the Contractor's liability to manage and finance, if it occurs. Comparatively in an IPD setting such as "PROJECT TWO", the liability of the Contractor for cost overrun is reduced as the cost of financing such excess cost can be shared with the Owner and the Architect if the circumstance is qualified for a shared IPD contingency expenditure guideline. Likewise, if there is a cost overrun due to change order, the Owner's liability is reduced, and per contingency guideline, the risk can be shared among the Owner, the Architect, and the Contractor.

7.5.3 Changes in Risk Exposure

- *IPD arrangement minimizes Owner's risks to some extent, as all IPD players collectively share risks and finance risks through IPD contingency*

In a traditional delivery approach, the Owner sets aside money for only the Owner Contingency, which is in a way design and estimating contingency. In an IPD arrangement, the Owner takes some of the money they traditionally put in Owner contingency and allocate that money to invest in the IPD contingency. In IPD arrangement, the Owner puts its contingency fund under two contingency pools: IPD contingency and Owner contingency.

IPD contingency is funded by the IPD players generally the Owner, the Contractor, and the Architect. The IPD players share risks and rewards applicable to the IPD contingency fund.

Thus, in an IPD arrangement, the Owner shares some of its risks and rewards with other IPD players that would otherwise be allocated to the Owner alone under a traditional delivery approach. In a way, shared IPD contingency replaces some portion of the Owner Contingency, which in a traditional approach is only funded by the Owner. As a result, the IPD arrangement minimizes the Owner's risks to some extent, as all IPD players collectively share risks (Owner/PM).

According to the Owner, it was in the best interest of the Architect and the GC to get the project done in time and under budget. As a result the Owner's risk was lowered (Owner).

- *According to the GC, the IPD has increased the GC's risk exposure*

According to the GC, the risk is increased because if the IPD contingency is gone the contractor's fee is at risk (Contractor).

Table 7-13: Comparison of risk exposure in IPD vs. traditional delivery approach according to the IPD participants in "PROJECT TWO"

Parties	Changes in risk exposure compared to a traditional delivery approach
Architect	Decreased
Project Manager	Decreased
Owner	Decreased
Contractor	Increased

7.5.4 Changes in the Process Management

7.5.4.1 Interaction

- *A higher level of interaction among the Owner, the Architect, the GC, and the Project Manager results from the establishment of the Core IPD Team and the Project Executive Team*

The IPD Core Team believes that the IPD approach requires more interaction from the parties. The core IPD meetings and the project executive meeting are the examples of the increased interaction.

> "The Project Executive Team shall establish a meeting schedule, which shall include regular meetings with the Core IPD Team. The Project Executive Team shall not meet less than monthly. The Core IPD Team shall establish a regular meeting schedule, which, unless the Core IPD Team agrees otherwise, shall require meetings no less frequently than weekly. Special meetings of either the Project Executive Team or the Core IPD Team may be called by any team member upon two business days' written notice to the other team members. The notice shall specify the reasons for the meeting and include a proposed agenda and any documents material to the subject matter for discussion" (IPD Agreement, p.9).

7.5.4.2 Decision making authority

- *Collaborative decision making for contingency allocation*

By virtue of the way that IPD agreement is written, there are two groups – Core Group and Senior Executive Group. The Core Group who is the more hands on group includes representatives from the GC, the Architect, and in this case, the two Owners.

The Core Group decides on how certain costs that were not anticipated are allocated, whether they go to one contingency or another. There are three types of contingency pools in this project: Owner contingency, IPD contingency, and Construction contingency (Owner, Project Manager).

If the Core Group is not able to reach agreement on cost allocation and contingency use, then the Senior Groups gets involved to address the issue. The Senior Group usually gets together once a month to discuss the project condition and how they could improve performance and reinforce collaboration (Project manager).

7.5.4.3 **RFI**

- *IPD offers a short cut solution to the lengthy waiting process associated with RFI*

In IPD, the Core Group structure allows the parties to identify and address the issues collaboratively early on before they would appear. Thus, the team would avoid potential issues and the time required for addressing them through the process of RFI and the associated lengthy cycles of emails. The IPD and the structure of the Core Group expedite the flow of information and communication (Owner).

7.5.5 **Changes in Risk Financing**

- *As opposed to risks being individually financed, in IPD some risks are collectively shared thru IPD Team Contingency and At-Risk amount of the Owner, Architect, and Contractor*

7.6 Trust Development Process

The information in this section is the combinatorial results of the interviews with the IPD Core team members. Through a series of open-ended questions participants are asked to define trust and discuss the parameters that are effective in establishing trust, promoting trust, and advancing participants' sense of belonging to the project. Based on the parameters above, a table is developed, to present the influential factors that result in trust-based relationships. Based on the nature of the influential factors, conclusions are made to demonstrate if/how a contract or project participants are effective factors in establishing and building trust.

7.6.1 Definition of Trust

- *Trust is a mutual confidence that things would be taken care of in a collaborative way (Owner/PM).*
- *Trust is mutual respect and empathy (Architect).*
- *Trust describes characteristics of individuals who are open and honest and deliver on their promises (Contractor).*
- *Trust is when individuals are honest, and looking out for the best interest of each other (Owner).*

Table 7-14: Trust definition according to the IPD participants

Definition of Trust	Mentioned by
Mutual confidence	*Owner B/PM*
Mutual respect and empathy	*Architect*
Honoring promises	Contractor
Honesty	Contractor, Owner A
Looking out for the best interest of each other	Owner A

7.6.2 Factors Facilitating Establishment of Trust

Trust building is an evolving process. Once the contract document was executed and the project started, the team handled any issue that arose on the project in a collaborative manner. The team's behavior reinforces the notion that the IPD is working, and the team can trust one another to do right things and accomplish project goals. Source

- *The collective discussion around the guidelines on contingency uses has positively impacted trust and collaboration among the parties.*

A series of contingency use guidelines is presented as an exhibit to the agreement. These contingency guidelines outline and list the appropriate uses for each contingency type (Owner contingency, IPD contingency, and Construction contingency).

At the beginning of the project, the team gathered to collaboratively review these guidelines and outline all of the ways in which each contingency can be used. The discussion was essential to eliminate future potential controversy on which contingency fund should be considered for a particular problem. These discussions have had an impact on promoting trust and collaboration (Owner B/PM).

Table 7-15: Factors facilitating trust-establishment according to the IPD participants in "PROJECT TWO"

Factors facilitating trust-building efforts
Collective discussion around the guidelines on shared contingency uses

7.6.3 Factors Promoting Trust

"PROJECT TWO" team correlates the growth of trust to the following influential factors (Table 7-16). Further description on some of these factors is provided in the following table.

Table 7-16: Influential factors promoting trust according to the IPD participants in "PROJECT TWO"

Influential element type	Trust	Factors promoting trust	Mentioned by
Contract	System-based Trust	Risks and rewards sharing	Owner B/PM
		Incentives alignment	Owner B/PM
		Shared IPD contingency	Contractor, Owner A
		Increased involvement and collective decision making	Architect, Owner B/PM
Project participants	Cognition-based trust	Honesty	Owner A, Contractor
		Honoring promises	Owner A
		Taking accountability and responsibility	Owner A
		Developing empathy	Architect
		Open communication / Information sharing	Contractor

7.6.3.1 **Contract**

- *Risks and rewards sharing*

Risk and reward sharing through the contract terms is an influential factor in promoting trust and collaboration. Even though other strategies like team building exercises, social gatherings, trips, and golfing can be effective in establishing and promoting stronger relationships between the parties, they may not necessarily translate to trust and collaboration on a project. Contract has a more significant impact, but despites the contract all the parties have to really believe in the principles rather than just the legal terms (Owner B/PM).

- *Incentives alignment*

The parties' incentives were aligned by this agreement. The Owner B/PM believes that the agreement and the incentive alignment have played a major role in making parties behave in a collaborative fashion (Owner B/PM).

- *Shared IPD contingency*

Shared IPD contingency has positively impacted collaboration and communication among the players. The IPD contingency, if remains unused at the end of the project, will be shared among the IPD players. As a result, the IPD contingency provides an incentive for all IPD players to continuously look for the most cost efficient solution for potential issues that requires IPD expenditure. According to the Contractor, their experience with the Architect in this project has been unique, as the Architect is much more communicative and collaborative to assist the Contractor in coming up with a more cost effective design solutions to retain the IPD contingency (Contractor and Owner).

- *Increased involvement and collective decision making*

The IPD necessitates increased involvement of the key IPD players in decision making throughout the project implementation. The IPD arrangement requires increased Owner's involvement on the project. Unlike the traditional delivery project that the Owner is not much involved in the project implementation and would often look for a party at fault when things go wrong, in the IPD the Owner's increased involvement enhances collaboration among the team and decreases finger pointing (Architect, and Owner B/PM).

7.6.3.2 Project participants

- *Honoring promises*

The Contractor and the Owners had done several other businesses with each other in the past. As a result the Contractor is very much familiar with the Owner's desire and their organization. According to the Owner, the Contractor has gone above and beyond their open book to make sure they deliver the project as they promised and that promotes trust between them (Owner).

- *Developing empathy*

The disincentive provisions for the Architect and the Contractor on not meeting the targeted schedule has positively impacted the amount of collaboration between the two (Architect).

According to the provisions in this IPD arrangement, the Architect and the Contractor have certain fees at risk if they do not meet the targeted schedule. For Owner A, the schedule was highly critical, as physicians and nurses were hired to start working at a certain date in the new facility. If the project delays the Owner still has an obligation to pay the newly hired staffs even though the facility is not ready and they cannot work.

7.6.4 Factors Promoting Participants' Sense of Belonging to the Project

Table below exhibits the influential factors promoting participants' sense of belonging to the project. Further description of each factor is provided below.

Table 7-17: Influential Factors Promoting Participants' Sense of Belonging to the Project according to the IPD participants in "PROJECT TWO"

Influential factors promoting participants' sense of belonging to the project	Mentioned by
Level of complexity and significance of the project	Owner B/PM
Mutual respect	Owner B/PM
Sophisticated, professional, and highly skilled participants	Owner B/PM
Reputation and the interest in continuing relationship for future works	Owner A
Keeping parties informed of the decisions/Collective decision making	Contractor
Mutual trust and addressing issues collaboratively	Contractor
Owner's clear vision for the project	Architect
Well defined but flexible scope	Owner B/PM

7.6.4.1 **Level of complexity and significance of the project**

The project by nature is one that everybody is proud of. It is a new health care campus on a green field site on a beautiful area with a spectacular setting. As the building gets completed people take pride on the fact that they were part of it, and that promotes participants' sense of belonging to the project (Owner B/PM).

7.6.4.2 **Mutual respect**

The parties involved respect one another in terms of professionalism (Owner B/PM).

7.6.4.3 **Sophisticated, professional, and highly skilled participants**

The project started at the economy downturn and recession. As a result, every party had their best people involved in the project. The IPD players in this project are made up of the best people of each party, the Owner, the PM, the Architect and the Contractor. The fact that everyone is putting the best effort forward has helped to build trust and make everyone feel that they are all part of something bigger (Owner B/PM).

7.6.4.4 **Reputation and the interest in continuing relationship for future works**

The Contractor has done several projects for the Owner in the past. They strive to continuously do a great job to protect and promote their reputation and to keep a long term relationship with the Owner.

The Architect, on the other hand, is working with the Owner for the first time. This would be a golden opportunity for them to establish a long term relationship with the Owner and to get into the Healthcare market in the Northwest area.

Thus, promoting professional reputation and establishing and keeping long term relationship with the Owner has been a huge driver for both the Contractor and the Architect to perform to their best of ability (Owner A).

7.6.4.5 **Keeping parties informed of the decisions/Collective decision making**

Keeping people informed about the project, the issues, and the decisions is critical in creating the sense of belonging to the project (Contractor).

7.6.4.6 **Mutual trust and addressing issues collaboratively**

Having mutual trust would make parties feel comfortable discussing their problems with each other. Sharing concern and collaborating on addressing each other's problem create a sense of belonging (Contractor).

7.6.4.7 **Clear vision for the project**

The owner was able to convey to the design partners and the contractor what it was that they were really trying to achieve. That provided the team with a ground base to start the job. As an example the Owner had very strong goals about having an essential place at the heart of the facility which eventually leads to an atrium as an organizing element where everyone would pass by, for example staff, visitors, and patients. The Owner's vision on this project was new to them. The project participants find it exciting to be part of a unique project and a team effort to conceive that vision (Architect).

7.6.4.8 **Well defined but flexible scope**

Project goals provided by the Owner are defined enough to provide the team with a Macro scope but not too detailed to limit the team's contribution and flexibility to further define and develop the main idea.

The Owner had a rough idea about the project when selecting the Design Team. However, the original idea got further tuned with the help of the design professionals. Participation of the Design Team in further developing scope was influential in promoting the participants sense of belonging to the project (Architect).

Contract has a significant impact on trust and collaboration, but despite the contract, all the parties have to really believe in the principles rather than just the legal terms (Owner B/PM).

7.6.5 **Conclusion: Influential Factors Leading to Trust-based Relationships**

The influential factors leading to trust-based relationships (Table 7-18)are the combinatorial results of prior tables on influential factors leading to establishment of trust (Table 7-15), development of trust (Table 7-16), and promotion of sense of belonging (Table 7-17).

Table 7-18: Influential factors leading to trust-based relationships according to the Core IPD Team in "PROJECT TWO"

Influential element type	Trust	Factors leading to trust-based relationship	Mentioned by
Contract	System-based Trust	Shared IPD contingency	Owner A, Owner B/PM, GC
		Risks and rewards sharing	Owner B/PM
		Incentives alignment	Owner B/PM
		Open communication / Information sharing	GC
		Increased involvement and collective decision making	Owner B/PM, Architect, GC
		Owner's clear vision for the project/ Well defined but flexible scope	Architect
Project participants	Cognition-based trust	Mutual respect	Owner B/PM
		Honesty	Owner A, Contractor
		Honoring promises/ Taking accountability and responsibility	Owner A
		Developing empathy	Architect
		Sophisticated, professional, and highly skilled participants	Owner B/PM
		Reputation and the interest in continuing relationship for future works	Owner A
		Keeping parties informed of the decisions	Contractor, Architect
Project		Level of complexity and significance of the project	Owner B/PM

As shown in the above table, trust-based relationships are influenced by contract, people, and project. IPD contract plays a key role in promoting collaboration. Shared risks/rewards, shared IPD contingency, IPD principles enforced thru contract, increased involvement, collaborative decision making and collective authority are the elements of the IPD contract that promotes trust and fosters collaboration among the team. Additionally, participants' characteristics also impact trust-based relationship.

Project complexity can also impact the level of collaboration. Usually in the more complex projects participants tend to be more collaborative, as they realize the importance of collaboration in successfully delivering the project.

7.7 Assessment of Trust

Trust is measured thru both direct questions assessing trust, and also indirect questions assessing trust-building attributes.

7.7.1 Direct Questions Measuring Individuals' Perceptions of Trust

First, the IPD participants were asked to discuss if trust-based relationships were established among the participants at the onset of the project. Then, they were asked to evaluate how the level of perceived trust has changed throughout the project, and to foresee how the level of trust will be changed towards the project completion. Table 7-19 exhibits the participants' perception of trust in the project.

Table 7-19: Assessment of trust throughout the project

Changes in the level of trust as project progresses	Owner	GC	Architect	Project Manager
Presence of trust-based relationships among participants	Yes	Yes	Yes	Yes
Changes in the perceived level of trust as project progressed	Confidential	Confidential	Confidential	Confidential
Forecast of how it will change	Increase	Increase	Increase	Increase

7.7.2 Indirect Questions Measuring Trust-Building Attributes

Level of trust was also measured through a series of indirect questions assessing the perceived level of trust-building attributes in the project. A series of multiple choice questions were developed based on the trust-building attributes framework (Table 5-1). From the scale of 1 (minimum level of trust) to 5 (maximum level of trust), the key IPD participants were asked to assess the perceived level of trust-building attributes in the project. For each trust-building attribute the mean is calculated, and a bar chart is developed accordingly (Figure 7-5).

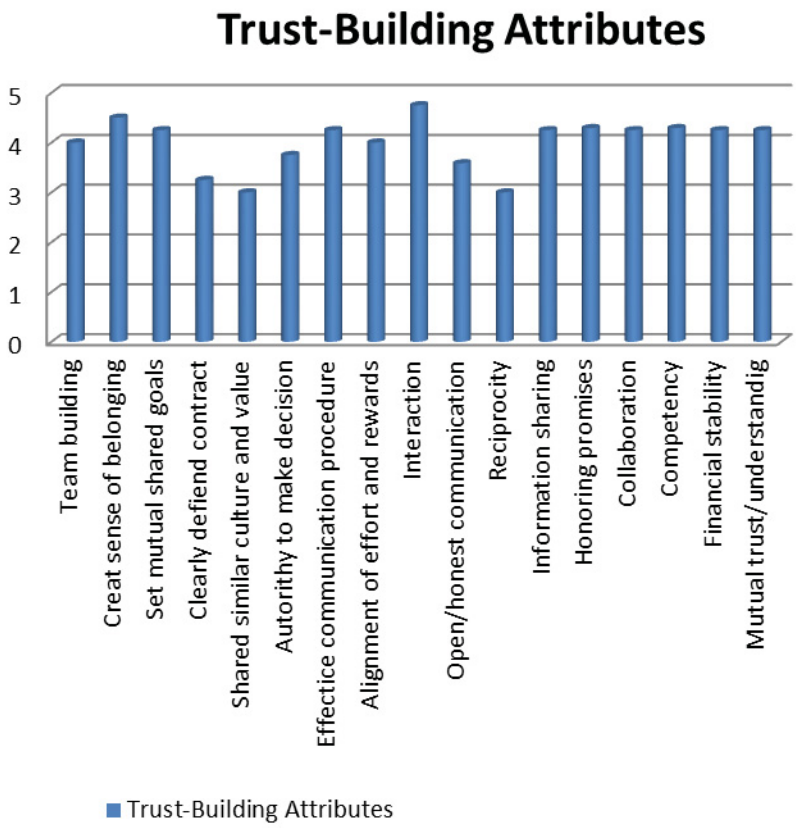

Figure 7-5: Assessment of trust thru trust-building attributes

Following is the description of trust-building attributes in "PROJECT TWO" as described by the key IPD players.

- *Team building activity*

As a team building activity, at the onset of the project the owner arranged a meeting with all key IPD players and the major subs and discussed the vision of the project, the goals, and what they were hoping to gain from the IPD process. In addition, throughout the project every quarter there was a follow up meeting to check on how everyone is doing (Owner). In addition, there were also couple education sessions on lean process. Other activities that have been beneficial in team- building throughout the project involves outside work activities, such as dinner, happy hours, and playing gulf that the whole team attended. Almost in every meeting types such as OAC meeting or IPD meeting, or senior leadership meeting the team is constantly looking for ways to improve their team performance (Contractor).

- *Team's familiarity with each other*

The owner and the project manager knew each other from the past. The project manager also had a past experience with the general contractor(O/PM).

The general contractor company and the architect company had a prior work experience together at the company level; their team members, however, did not have a past work experience together.

The general contractor also had prior work experience with the structural engineer, civil engineer, mechanical engineer, electrical engineer, and the landscape designer (GC).

The architect had past work experience with the owner at the organization level, but not with the same people. The architect selected most of the consultants with whom they had past work experience; and some of the consultants were selected directly by the owner.

7.8 IPD Approach and Trust-based Relationship

This section demonstrates if/how trust-based relationships and IPD contract correlates. The interview questionnaire includes a series of multiple choice questions which examine the relative effectiveness of IPD versus a traditional delivery approach on trust-building attributes. There are three choices: 1. Less effective, 2. Same, 3. More effective. For the demonstration purpose, an assumption is made to give the effectiveness level of a traditional delivery approach on trust-building attributes, level three. Less effective influence is illustrated in level one, and more effective influence is illustrated in level five. The mean of participants' responses were calculated, and a bar chart developed correspondingly to schematically demonstrate the relative effectiveness of the IPD approach versus a traditional delivery approach on trust-building attributes**Error! Reference source not found.**. The red dotted line represents the effectiveness of the traditional delivery approach on trust-building attributes, and the blue bars represent the effectiveness of IPD approach on trust-building attributes.

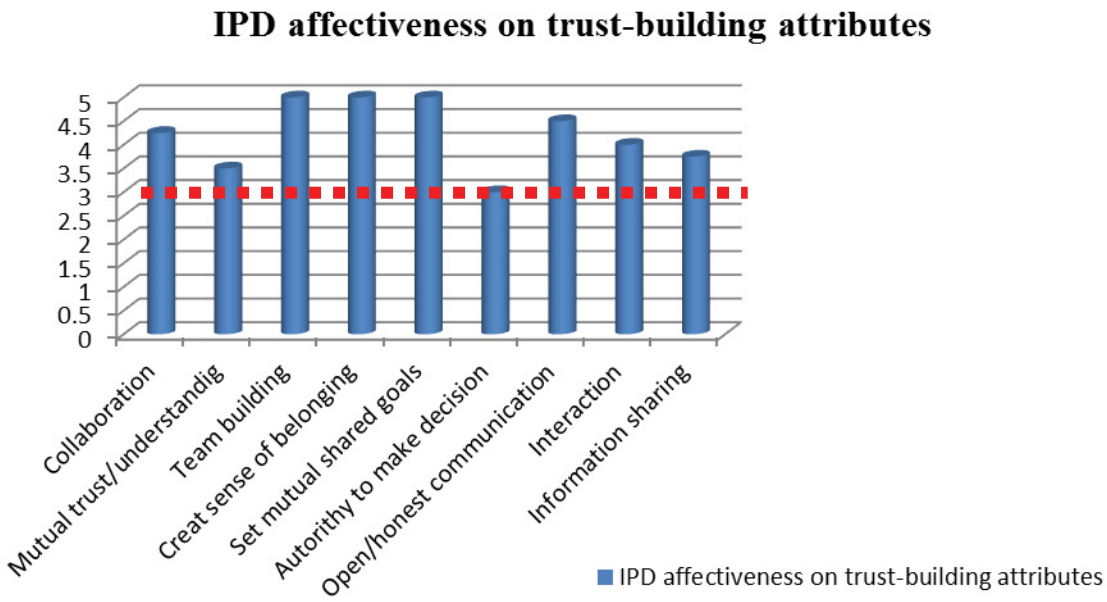

Figure 7-6: Comparative effectiveness of IPD versus a traditional delivery approach on trust-building attributes in "PROJECT TWO"

CHAPTER 8 SUMMARY, CONCLUSION, RECOMMENDATIONS FOR FUTURE WORK

This dissertation explored the Integrated Project Delivery (IPD) approach and trust-building attributes in construction contracting through conducting a literature analysis and developing two IPD case studies.

The research results shed light on IPD contracting strategies, traits differentiating IPD from a traditional delivery approach, the development of trust-based relationships, and the inter-correlation between trust and IPD. This research sets a solid stepping stone towards exploring IPD and promoting integration, trust, and collaboration in the delivery of construction projects.

The trust-building framework presented in this work includes a series of techniques that the contracting parties can follow when establishing their contractual and managerial strategies and also when interacting with each other.

The following sections provide brief overviews on the research findings. More thorough descriptions of the result can be found in previous chapters.

8.1 Summary & Conclusion

8.1.1 Integrated Project Delivery (IPD) Approach

This section provides a brief overview to the definition of IPD and illustrates the Project Delivery and Contracting Strategies (PDCS) elements of the IPD approach. The findings are based on the information collected through a literature review, expert panel discussion, interviews with the key IPD players (8 interviewees), and the study of contract documents of the two IPD projects.

8.1.1.1 IPD Definition

Integrated Project Delivery (IPD) is developed to overcome the challenges that the A/E/C/FM industry has been facing throughout the past decades: 1. increased number of RFI, 2. re-works, and 3. disputes. These deficiencies are attributed to the industry fragmentation and lack of collaboration between various disciplines involved in a construction project. In response to these key challenges numerous principles and strategies have been developed which has led to a new delivery system called IPD. Table 8-1 demonstrates how IPD principles mitigate these issues.

Table 8-1: Challenges associated with the traditional delivery systems and the solutions offered by IPD

Challenges Associated with Conventional Delivery System	Solutions Offered by IPD to Address the Challenges
Growing number of RFI	Early involvement of parties Jointly developed project goals and criteria Design Assist subcontractors Open communication Information sharing Collaborative decision making
Rework due to: Design errors and omission, Constructability issues, Value engineering	Design Assist Subcontractors Target value design Early involvement of parties
Finger pointing	No suit (waiver of liabilities) Waiver of consequential damages Collaborative decision making Shared liability

IPD approach is a collaborative alliance of people, systems, business structures and practices into a process that aims to increase value to the owner through reducing waste and maximizing efficiency. Like other project delivery methods, IPD may appear in different varieties of contract types. IPD is a spectrum of integrated approaches and not a single delivery or contract type. The IPD spectrum starts with the delivery approaches that have the following traits: 1. The IPD goal of eliminating waste and maximizing efficiency and value, 2. Early involvement of constructors in planning and design phase, 3. Sharing risks and rewards to some extent, 4. Establishing an IPD relational contract between the Owner, the Designer, and the Constructor, in addition to the multiple two-party contracts, and 5. Utilizing IPD contractual and behavioral principles. The other end of the IPD spectrum presents the purest form of IPD with the highest level of integration. The purest form of IPD in addition to the above traits utilizes a single multi-party agreement bonding all key IPD participants, enforces shared risks and rewards to a greater extent, and waives liabilities among the parties.

Figure 8-1: IPD spectrum

There are numerous variations of IPD approach throughout the IPD spectrum depending on the contract form, applied IPD contractual principles and strategies, and tools and techniques that facilitates integration. As illustrated in Table 8-2, participants' commitments to the IPD behavioral principles, early involvement of key participants, shared financial risks and rewards, and the presence of either a single multi-party contract or a joining/bridging IPD agreement among the Owner, the Designer, and the Constructor are the required features of an IPD contract. Other elements further enhance the level of integration of an IPD process.

Table 8-2: Traits defining IPD

Type of Variables	Variables Defining the Level of Integration in IPD	Absolutely Required to be Considered IPD
Behavioral principles	Mutual respect and trust Willingness to collaborate Open communication Collaborative innovation Honoring promises Acting in the best interest of the project Organization and leadership	X
Contractual Principles	Shared risks and rewards	X
	Liability waivers	
	Fiscal transparency between key participants	
	Early involvement of key participants	X
	Intensified early planning	
	Jointly developed project target criteria	
	Collaborative decision making and control	
Relational Contract Type	Single multi-party contract	X
	IPD agreement in addition to multiple contracts	
Catalyst to IPD	Lean techniques	
	BIM	
	Co-location of the team	
	Organization & leadership	

8.1.1.2 PDCS Framework for IPD Approach

As discussed in the case study chapters, the PDCS framework was used to collect information on the project delivery and contracting strategies implemented in the two IPD projects. Each case study was structured and developed around the PDCS framework. The following figures (Figure 8-2,
Figure 8-3, and Figure 8-4) exhibit the selection factors, macro and micro elements of project delivery and contracting strategies (PDCS) shaping the IPD approach in the two case studies. Further descriptions on each element can be found in the respective case study chapters.

SELECTION FACTORS OF IPD	PROJECT ONE	PROJECT TWO
Project Characteristics	Building Type: Hospital Cost: $385 Million Size: 720,000 SF	Building: Hospital & Medical Office Cost: $250 Million Size: 600,000 SF
Project Objectives	To build within budget & schedule Lean delivery	To build within budget & schedule Lean delivery
Owner's Characteristics	Highly involved Also hired a Project Manager	Highly involved Also hired a Project Manager
Participants' Characteristics	Collaborative Expert and Professional	Collaborative Expert and Professional

Figure 8-2: Selection factors for IPD in "PROJECT ONE" and "PROJECT TWO"

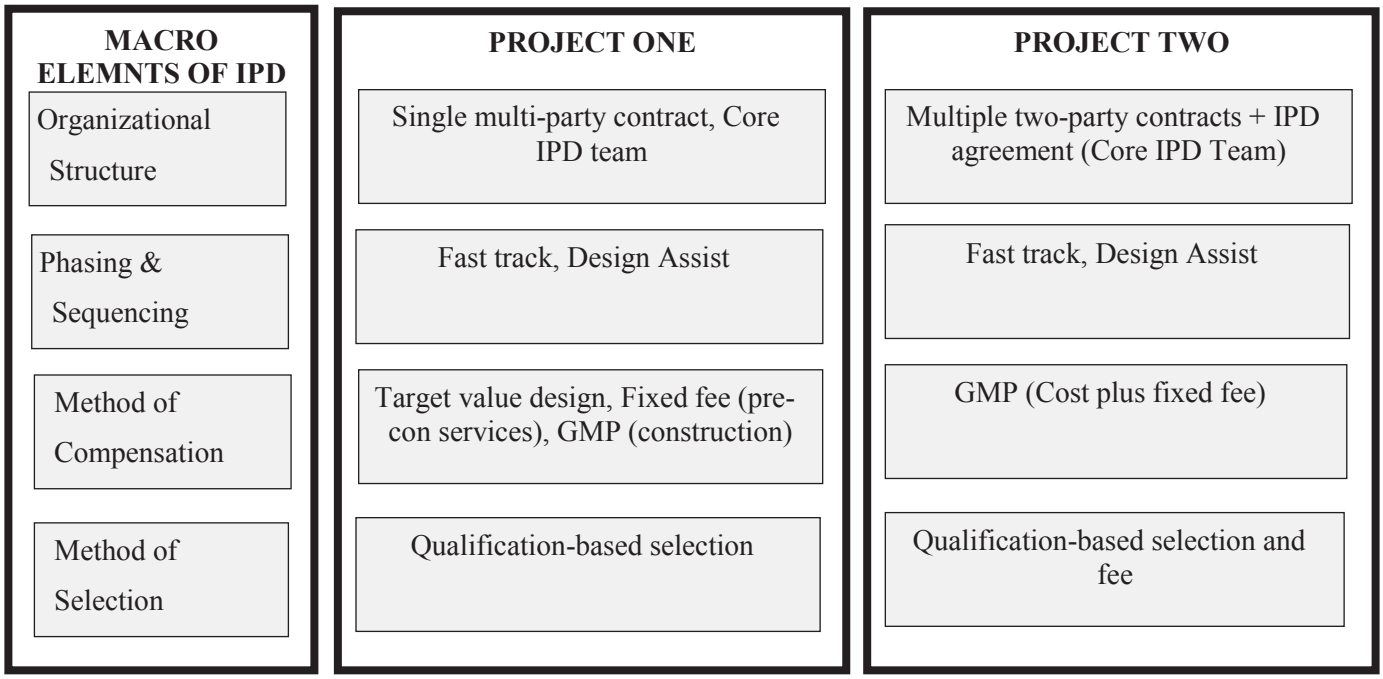

Figure 8-3: PDCS macro elements of IPD in "PROJECT ONE" and "PROJECT TWO"

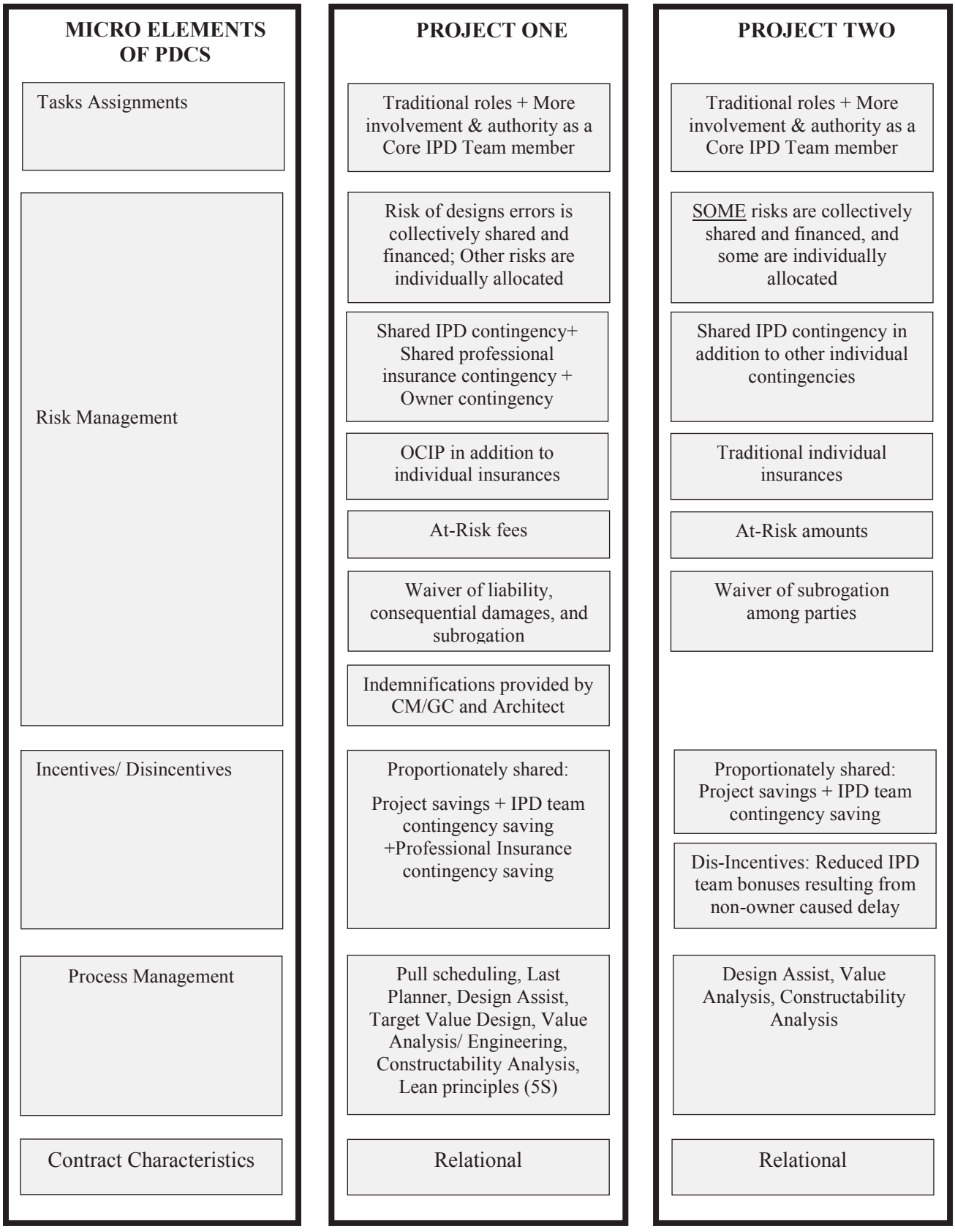

Figure 8-4: PDCS micro elements of IPD in "PROJECT ONE" and "PROJECT TWO"

Based on the literature review, expert panel discussion, and the two IPD case studies, the following PDCS framework for IPD (Figure 8-5,

Figure 8-6, Figure 8-7) is developed to demonstrate the PDCS elements featuring a typical IPD approach. As mentioned previously, the IPD approach involves a variety of project delivery and contracting strategies (PDCS) along the IPD spectrum each presenting a different level of integration. Thus, it is not appropriate to assume that all IPD approaches follow the same PDCS. However, it can be said that an IPD approach may include similar features as follow.

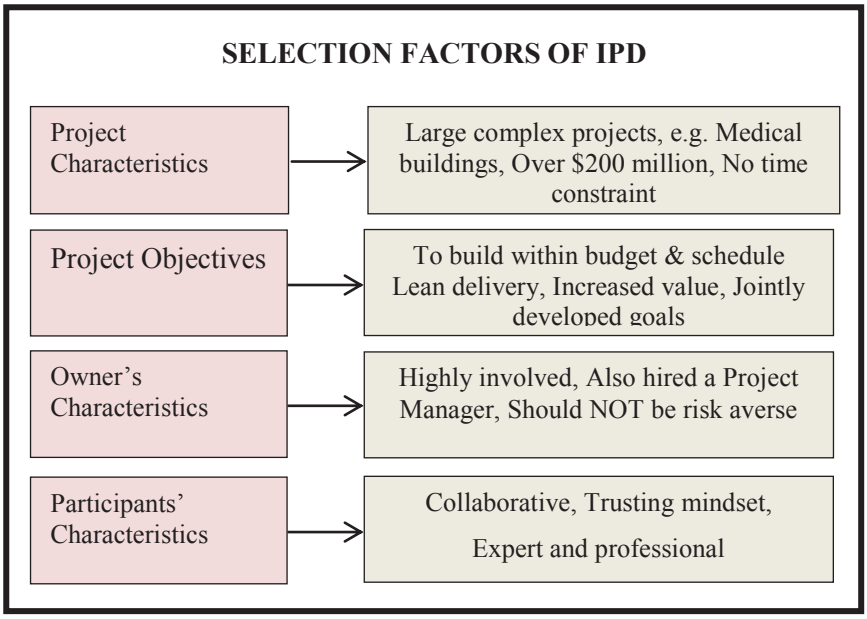

Figure 8-5: Selection factors of IPD

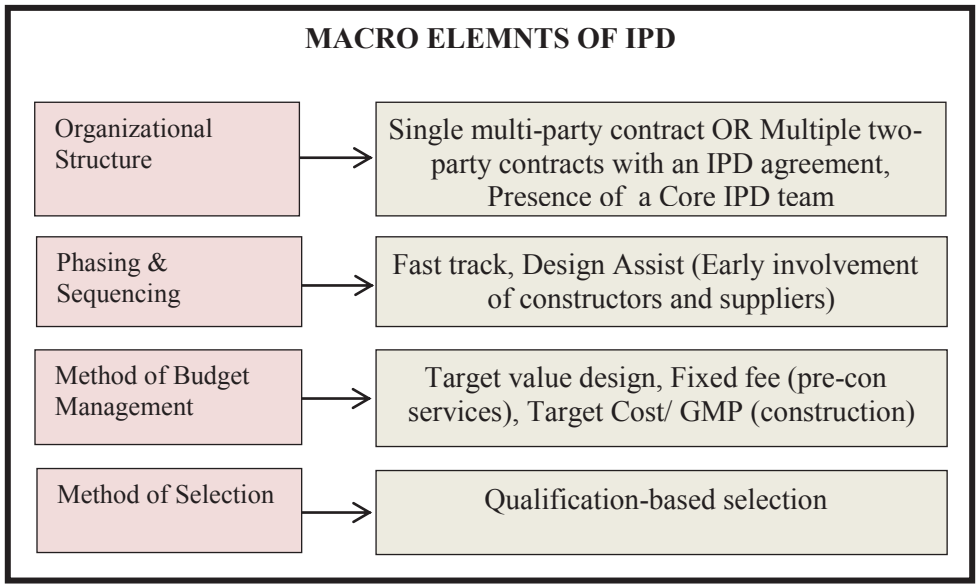

Figure 8-6: Macro elements of IPD

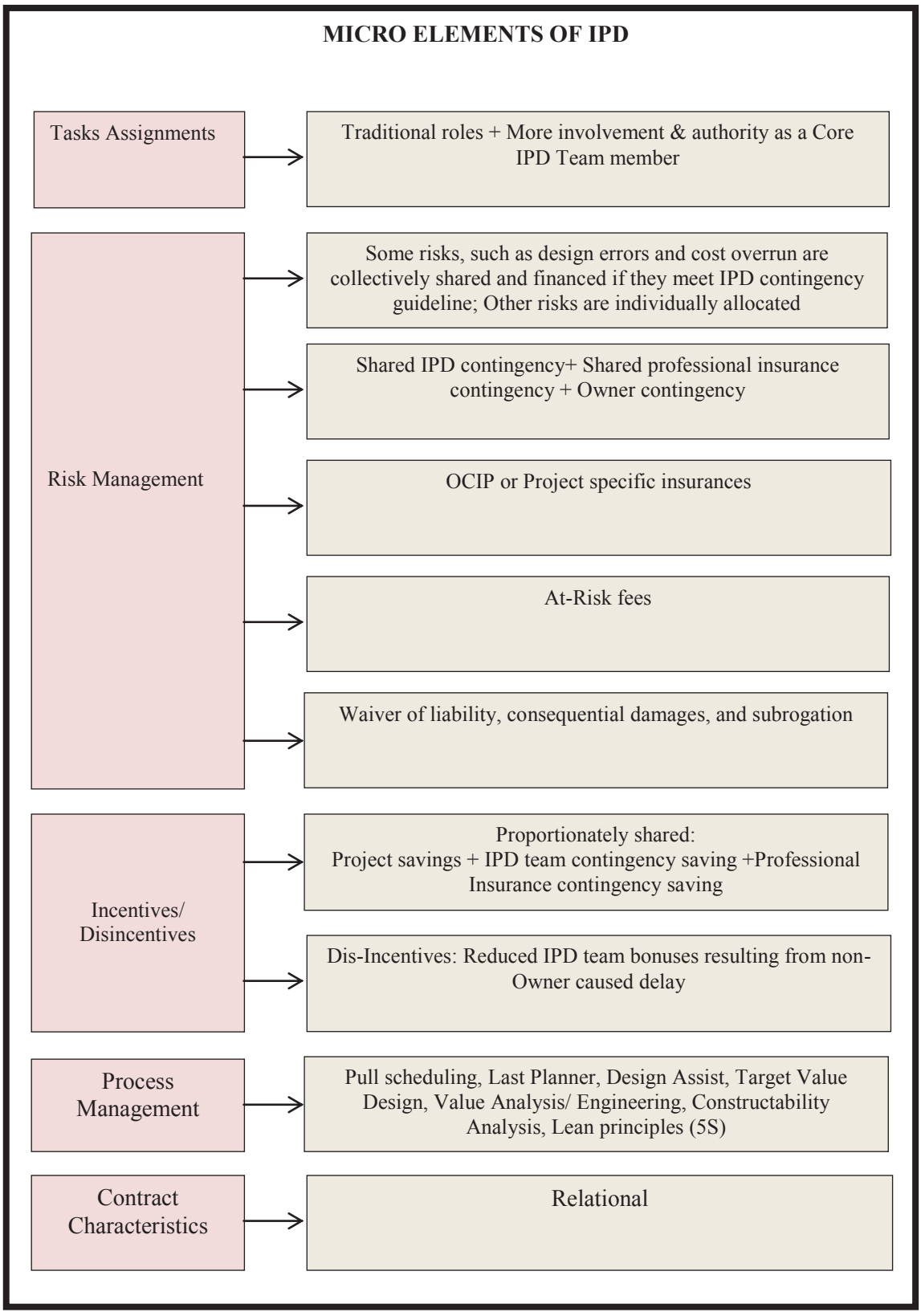

Figure 8-7: Micro elements of IPD

8.1.2 Comparative Analysis of IPD vs. a Traditional Delivery Approach

The comparison of the IPD and a traditional delivery approach is a broad scope without referring to a specific contract; because there are many varieties of contracting strategies that can be attributed to a specific project delivery approach. Thus it is difficult to make such a comparison without referring to those contracts. However, a macro level comparison can be made if referring to the two opposite ends of the project delivery spectrum—the purest form of a traditional delivery approach and the purest form of an IPD approach. The comparative analysis of IPD and a traditional delivery approach is performed utilizing various sources and different standpoints: 1. Literature review, 2. PDCS framework, and 3. Interviews with the IPD players in the two IPD projects. The following sections present the results of these comparisons.

8.1.2.1 Comparison of the IPD and Traditional Delivery Approach from the Standpoints of Behavioral, Contracting, and Technological Approaches

Based on the information gathered through the literature review and the two case studies, the author creates a chart (Table 8-3) that presents the key differences of the IPD and the traditional delivery approach from the standpoints of behavioral/ contracting / and technological approaches.

Table 8-3: Comparison of IPD vs. traditional delivery approach from the standpoints of behavioral, contracting, and technological approach

Approach	Integrated Project Delivery (IPD)	Conventional Delivery Approach
Behavioral Approach	Collaborative team	Separate "silos"
Contracting Approach	Single multi-party agreement Or A bridging/joining IPD agreement in addition to the multiple two-party agreements	Multiple two-party agreements
	Some risks are collectively shared	Risks are individually allocated
	Rewards are collectively shared	Individual performance-based incentives
	Early involvement of key participants	Linear procurement process
	Collaborative decision making and control	Hierarchy management, Dictatorship (by owner)
	Jointly developed project target criteria	Project goal is developed by the owner and its agent without the involvement of the contractor
	Fiscal transparency between key participants	Absence of fiscal transparency
	Waivers (liability, subrogation, consequential damages)	No liability waiver
Technological Approach	Collaborative tools like BIM	Segmented tools

8.1.2.2 Comparison of the IPD and Traditional Delivery Approach Utilizing PDCS Framework

Based on the information gathered through the literature review and the two case studies, the author utilizes the PDCS framework to demonstrate the differences between the IPD and the traditional delivery approach. As mentioned earlier, the comparison is between the two opposite ends of the PDCS spectrum—the purest form of the traditional delivery approach and the purest form of IPD (Figure 8-8 and Figure 8-9). Further description on the PDCS elements of IPD can be found in the case study chapters.

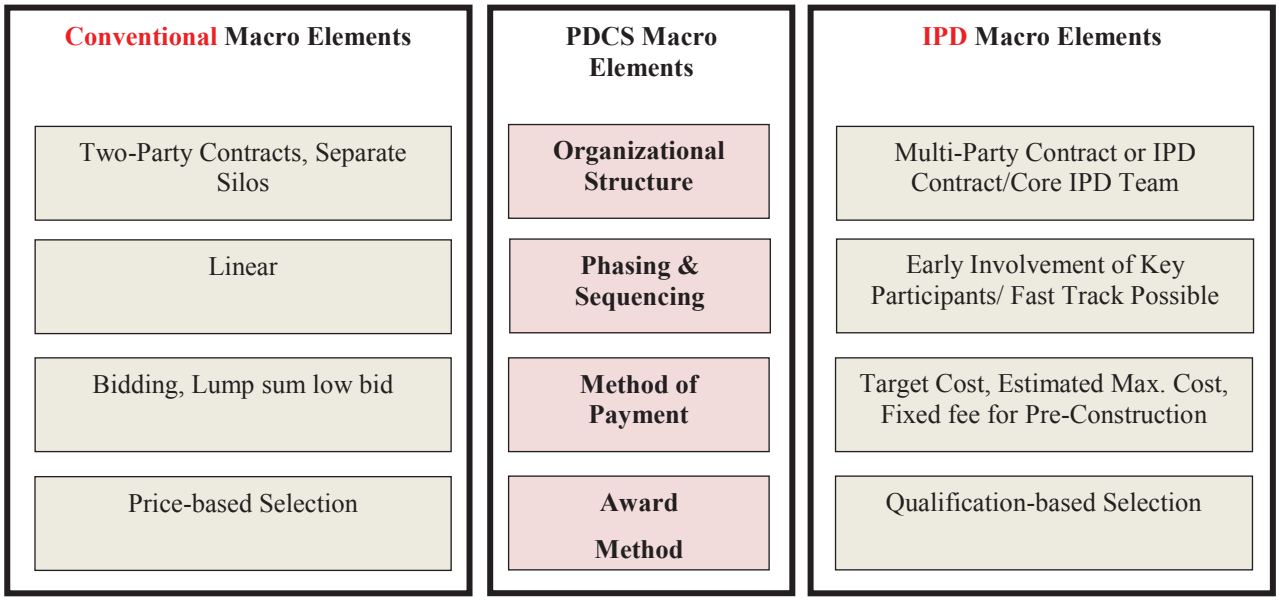

Figure 8-8: Comparison of IPD vs. traditional delivery approach from the standpoint of PDCS macro elements

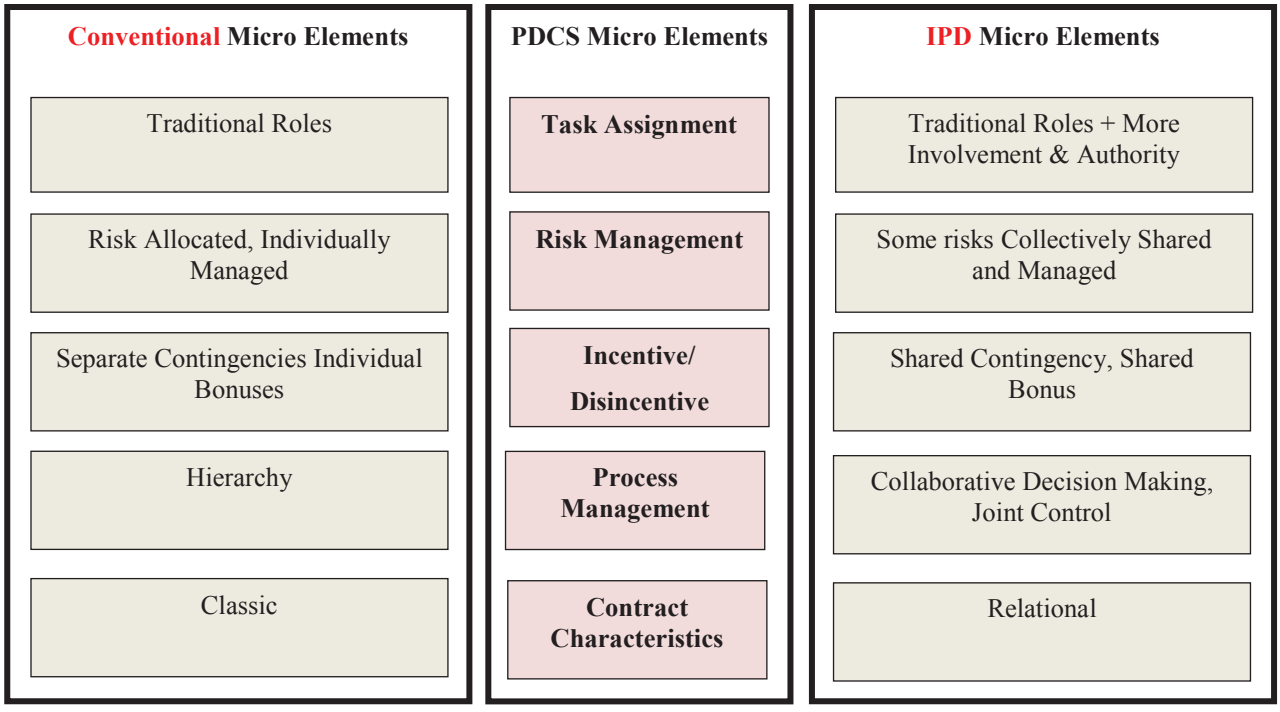

Figure 8-9: Comparison of IPD vs. traditional delivery approach from the standpoint of PDCS micro elements

8.1.2.3 Comparison of the IPD and Traditional Delivery Approach from the Standpoints of the IPD Participants in the two Case Studies

Table 8-4 presents the comparison result of the IPD and the traditional approach from the standpoints of the IPD participants in the two IPD case studies—"PROJECT ONE" and "PROJECT TWO". The interviews were recorded, transcribed, analyzed, integrated, coded, and the following categories emerged. Further explanation on each topic can be found in the case study chapters under the relevant sections. The citation source for each statement is identified in the following table.

8-4: Comparison of IPD and traditional delivery approach from the standpoints of the IPD participants in "PROJECT ONE" and "PROJECT TWO"

Elements differentiating IPD from a traditional delivery approach		Note	PROJECT ONE	PROJECT TWO
Changes in the process management	Interaction	More interaction resulting from the establishment of IPD Core Team and the Project Executive Team	IPD Core Team Members	IPD Core Team Members
	Decision making authority	Collective decision making, Majority vote for contingency allocation	IPD Core Team Members	Owner, PM
	Open dialogue	Risk sharing attributed to IPD encourages information sharing and open dialogue.	IPD Core Team Members, emphasized by CM/GC	
	Target value Design	In IPD, design and budget management efforts occur concurrently, while in a traditional setting the cost estimating and budget management efforts follow each design phase.	Architect	
	Change management	Change management process in IPD is much easier and less time consuming.	CM/GC	
	Leadership	In IPD, team members participate in leadership efforts and take a more proactive role in steering the project to the right direction.	CM/GC, PM	
	RFI	IPD offers a short cut solution to the lengthy waiting process associated with RFI		Owner
Changes in roles and responsibilities of participants		Similar roles and responsibilities as traditional delivery approach but with more involvement and authority In addition to traditional roles and responsibilities, parties are responsible for management of shared contingency	CM/GC, Architect	Architect, PM

Changes in risk exposure		More Risk Exposure, less risk intensity IPD arrangement minimizes Owner's risks to some extent, as all IPD players collectively share risks and finance risks through IPD contingency	Owner, PM, Architect	Owner, PM
		Architect's risk exposure is decreased	Architect	Architect
		Contractor's risk exposure is remained the same		CM/GC
		Contractor's risk exposure is increased		GC
Changes in liabilities	Some liabilities are shared	In IPD setting, liability for design errors and omission and/or cost overrun is shared as it relates to contingency expenditure and/or At-Risk Dollars	Architect, CM/GC	IPD Core Team members
Changes in Risk Financing	Shared IPD contingency and at-risk amounts	As opposed to risks being individually financed, in IPD some risks are collectively shared thru IPD Team Contingency and At-Risk Amount of the Owner, Architect, and Contractor	IPD Core Team members	IPD Core Team members

8.1.3 Trust-based Relationships: Establishment and Development

The following sections include information on definition of trust, factors facilitating establishment of trust, and factors promoting trust. The following information is the integrated result of both literature analysis and interviews conducted with the IPD participants in the two IPD case studies.

8.1.3.1 Definition of Trust

Table 8-5 exhibits the key traits defining trust as pointed out by the IPD participants in the two IPD case studies.

Table 8-5: Definition of trust according to the IPD players in "PROJECT ONE" and "PROJECT TWO"

Definition of Trust
Honesty
Honoring promises
Goals alignment / Acting in the mutual interest of each other
Fear/anxiety free interaction, Uninhibited feeling/ Do not need to be protected
Mutual confidence
Mutual respect and empathy
Looking out for the best interest of each other

8.1.3.2 Factors Facilitating Establishment of Trust

The following framework (Table 8-6) presents the combinatorial results of the literature-based framework on trust-building attributes and the frameworks presenting the results of the interviews conducted with the IPD participants in each project. The IPD participants in the two IPD projects were interviewed to discuss the influential elements facilitating the establishment of trust. The interviews were recorded, transcribed, analyzed, coded, and integrated to extract the emerging themes. The result is outlined as tables presenting factors facilitating establishment of trust in each case study (**Error! Reference source not found.** Table 6-15 and Table 7-15). The literature-based framework of trust-building attributes (

Table 4-1) was then used as a baseline to check mark and map out the elements suggested by the interviewees and to identify their corresponding trust types. The check marks (√**)** in Table 8-6 indicate the elements of the literature-based framework that are also suggested by the interviewees as the influential factors facilitating establishment of trust. The items that have grey color font represent the elements of the literature-based framework, which are not suggested by the project participants in the interview. All the items suggested by the interviewees already existed in the literature-based framework, which was developed by the author through literature review and analysis.

Table 8-6: Factors facilitating establishment of trust according to the IPD players in "PROJECT ONE" & "PROJECT TWO"

Trust Type		Trust-Building Attributes	Elements pointed out by PROJECT ONE & TWO participants
System-based	Organizational Policy/ Team Building Strategy	1. Team building	
		2. Create sense of belonging	
		3. Set mutual /shared goals	
		4. Clearly defined policy about time, cost, risks…	
		5. Shared similar culture and value	
		6. Authority to make decisions	
	Communication System	7. Establish effective communication procedure	
	Contracts and Agreements	8. A clearly defined contract/ Clearly define roles and responsibilities	
		9. Contract form	
		10. Fair/Equitable agreements or contracts terms	
		11. Alternative dispute resolution	

		12. Alignment of effort and reward	
		13. A balanced risk/reward sharing	
Cognition-based	Interaction/ Behavior	14. Promote work related interaction (e.g. The collective discussion around the guidelines on shared IPD contingency)	√
		15. Open and honest communication/ permeability	
		16. Behavior and interaction of partners: Reciprocity	
		17. Information sharing	√
		18. Honoring promises	√
		19. Collaboration (Self-formed integrated team)	√
	Knowledge/ Competencies/ Reputation	20. Competence/ Experience/Performance/ Problem solving	
		21. Financial stability	
		22. Good reputation/ Experience	√
	Macro-Economic factor	23. Macro-Economic condition	
Affect-based	Being Thoughtful	24. Mutual understanding/showing care	
		25. Taking into consideration the needs of each other	
		26. Mutual respect and appreciation	√
	Emotional Intelligence	27. Develop personal relationship	
		28. Long term relationship	√

As shown in Table 8-6, the trust-building attributes that facilitates "establishment" of trust correspond with the Affect-based trust and Cognition-based trust. These two trust-building categories are mainly dependent on individuals' characteristics and interactions. However, the System-based trust, which is dependent on the system and organizational policy in place, is not effective in facilitating the establishment of trust. The check marks (√) in Figure 8-10 illustrate that, from the three types of trust categories, only the trust-building attributes corresponding with the Cognition-based trust and Affect-based trust are influential in establishing trust.

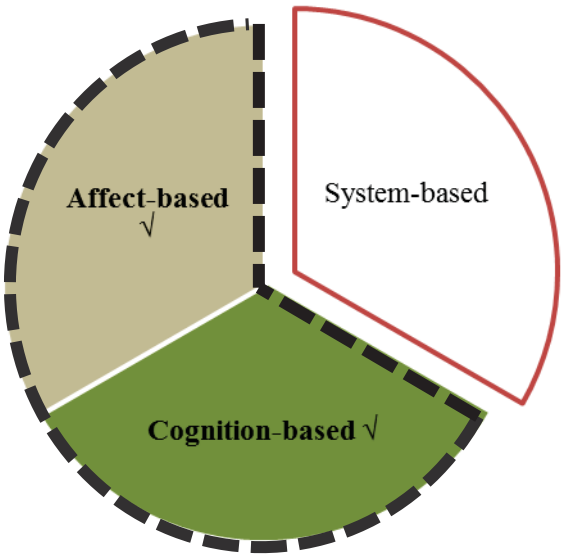

Figure 8-10: Trust building attributes categories facilitating trust-establishment

8.1.3.3 Factors Promoting Trust

The following trust-building framework (Table 8-7) presents the combinatorial results of the literature-based framework on trust-building attributes (

Table 4-1) and the frameworks of trust-based relationship (Table 6-18 & 7-18), which are the results of the interviews conducted with the IPD participants in each project. The IPD participants in the two IPD projects were interviewed to discuss the influential elements promoting trust. The interviews were recorded, transcribed, analyzed, coded, and integrated to extract the emerging themes. The result is outlined as tables presenting factors promoting trust in each case study (Table 6-16 and Table 7-16). The literature-based framework of trust-building attributes (

Table 4-1) was then used as a baseline to check mark and map out the elements suggested by the interviewees and to identify their corresponding trust types. The check marks (√) in Table 8-7 indicate the elements of the literature-based framework that are also suggested by the interviewees as the influential factors promoting trust. The plus (+) signs indicate the elements suggested by the interviewees as the

influential factors promoting trust, which are not included in the literature-based framework. The items that are have grey color font represent the elements of the literature-based framework, which are not suggested by the project participants in the interview.

Table 8-7: Framework of trust-building attributes (Final version)

Trust Type		Trust-Building Attributes	Elements pointed out by the PROJECT ONE participants	Elements pointed out by the PROJECT TWO participants
System-based	Behavioral principles	IPD principles enforced in the IPD agreement	+ CM/GC, PM	
		The Ten Commandments	+ PM	
		Leadership	+ PM	
	Team building & team alignment through contract	Team building/ Empowered core group	√ PM	
		Shared risks and rewards	√ CM/GC	√ Owner B/PM
		Shared IPD contingency		+ Contractor, Owner A
		Aligning individuals' goals through incentives/ Tying individual success to project success/ Shared goals	√ Owner , Architect	√ Owner B/PM
		Create sense of belonging/ Jointly developed project criteria	√ Owner , Architect	
		Fair Equitable contract beneficial to all		
		Shared similar culture and value		
	Clarity of the contract	Owner's clear vision for the project/ Well defined but flexible scope		√ Architect
		Clearly set expectations		+ Architect
	Performance assessment	Regular assessment of performance against goals and expectations	+ Owner, PM	
	Involvement	Collective authority	+ Owner, CM/GC	+ Owner B/PM, Architect, GC
		Effective communication		

		procedure		
		Collaborative decision making/ Keeping parties informed of the decisions	√ Owner, PM, Architect	√ Owner B/PM, Architect, GC
Cognition-based trust	Interaction/Behavior	Promote work-related interaction/ Regular meetings required by contract	√ PM	√ Contractor, Architect, Owner/PM
		Open dialogue and honesty	√ Owner, PM, CM/GC	√ Owner A, GC
		Mutual respect/ Behavior and interaction of partners: Reciprocity	√ PM, CM/GC	√ Owner B/PM
		Information sharing	√ PM, CM/GC	√ GC
		Honoring promises/ Taking accountability and responsibility		√ Owner A
		Collaboration/ Addressing the issues collaboratively • Level of complexity and significance of the project • The uniqueness of the implementation strategy	√ Owner, PM, Architect	√ Owner B/PM, Architect, GC
		Early wins	+ Owner	
		Team with the mindset of ensuring project success	+ Architect	
	Knowledge, reputation, experience	Competence/ Experience/Performance/ Problem solving		√ Owner B/PM
		Financial stability		
		Good reputation/ Experience	√ Architect	√ Owner A
Affect-based trust	Being thoughtful	Mutual understanding/showing care/ Developing empathy		√ Architect
		The sustained level of excitement and enthusiasm on behalf of the owner for the project		+ Regular meeting, Continuous interaction

		Taking into consideration the needs of each other		
		Mutual respect and appreciation	√ PM, CM/GC	√ Owner B/PM
	Emotional intelligence	Develop personal relationship	√ Architect	
		Long term relationship	√ Architect	

As shown in Table 8-7, majority of the trust-building attributes that promote trust-based relationships correspond with the System-based trust. Some of the trust-building attributes also correspond with the Cognition-based trust and Affect-based trust. As discussed earlier in the literature chapter a System-based trust is established through formalized and procedural/legal arrangements.

The check marks (√) and the numbers in Figure 8-11 indicate that all the three types of trust categories include trust-building attributes that are proved to be effective in promoting trust-based relationships. The System-based trust includes the majority of the influential elements, next is the Cognition-based trust, and Affect-based trust.

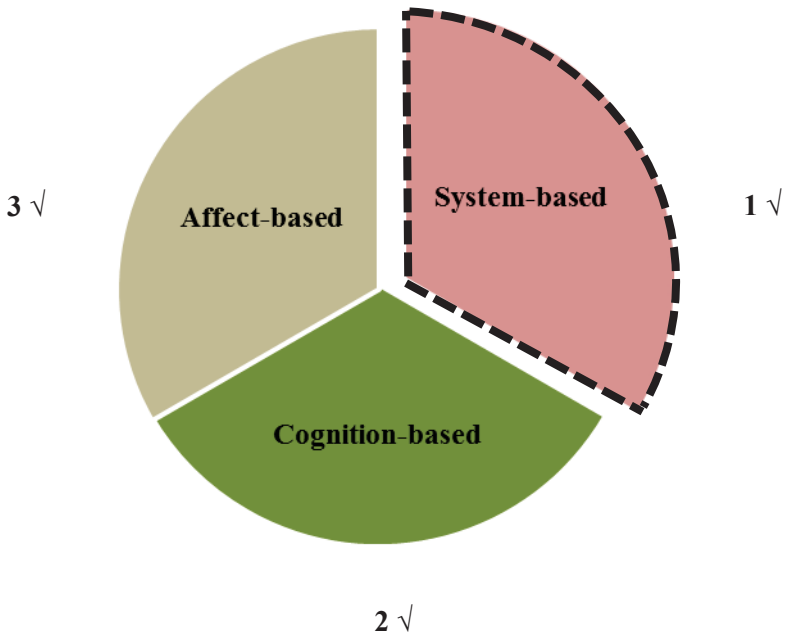

Figure 8-11: Trust-building attributes categories promoting trust

8.1.4 **IPD and Trust Correlation**

Lastly, through a side by side comparison, the research demonstrates how the IPD principles and contractual strategies correspond with the trust-building attributes. The final version of trust-building framework (Table 8-7) is used as a basis to perform this parallel comparison. Table 8-8, Table 8-9, and Table 8-10 demonstrate the result.

Table 8-8: IPD principles corresponding system-based trust

Trust Type	Trust-Building Attributes		IPD Principle	
System-based Trust	Team building & team alignment thru contract	Team building/Empowered core group	IPD Contractual Principles	Early involvement of participants/ Core IPD team
		Shared risks and rewards		Single multi-party or IPD agreement Shared financial risks and rewards (e.g. Shared IPD contingency, shared project saving)
		Shared IPD contingency		Shared IPD contingency
		Aligning individuals' goals thru incentives/ Tying individual success to project success/ Shared goals		Jointly developed project goals Individual's success ties to project success Acting in the best interest of the project Shared IPD Contingency/ Shared Project Saving
		Create sense of belonging/ Jointly developed project criteria		Collective decision making Joint developed project goals Collective authority and control
		Fair Equitable contract beneficial to al	IPD Contractual Principles	Key participants bound together as equal
		Shared similar culture and value		Efforts to promote a shared culture and value
	Clarity of the contract	Owner's clear vision for the project/ Well defined but flexible scope		Contract Dependent
		Clearly set expectations		Contract Dependent
	Performance assessment	Regular assessment of performance against goals and expectations		Contract Dependent
	Involvement	Collective authority		Collective authority/Joint Control
		Effective communication procedure/ Regular meetings required by contract		Colocation of the team BIM Core IPD team meeting
		Collaborative decision making/ Keeping parties informed of the decisions		Collaborative Decision Making

Table 8-9: IPD principles corresponding cognition-based trust

Trust Type	Trust-Building Attributes		IPD Principles	
Cognition-based trust		IPD principles enforced in the IPD agreement	IPD Behavioral Principles	
		Leadership	Individual dependent	
		Promote work-related interaction	IPD Contractual Principles	Colocation Core IPD team meeting Design-assist Target value design Early involvement of key participants
		Open dialogue and honesty		Open communication Fiscal transparency
	Interaction/ Behavior	Mutual respect/ Behavior and interaction of partners: Reciprocity	IPD Behavioral Principles	Mutual trust and respect
		Information sharing	IPD Contractual Principles	Information sharing
		Honoring promises/ Taking accountability and responsibility	IPD Behavioral Principles	Honoring promises
		Collaboration/ Addressing the issues collaboratively Level of complexity and significance of the project The uniqueness of the implementation strategy		Willingness to collaborate Collaborative innovation
		Early wins thru setting interim goals and regular assessments	IPD Contractual Principles	
		Team with the mindset of ensuring project success	Individual dependent	
	Knowledge, reputation, experience	Competence/ Experience/Performance/ Problem solving	Individual dependent	
		Financial stability		
		Good reputation/ Experience		
		Long term relationship		

Table 8-10: IPD principles corresponding affect-based trust

Trust Type	Trust-Building Attributes		IPD Principles	
Affect-based trust	Being thoughtful	Mutual understanding/showing care/ Developing empathy	Individual dependent	
		The sustained level of excitement and enthusiasm on behalf of the owner for the project		
		Taking into consideration the needs of each other		
		Mutual respect and appreciation	IPD Behavioral Principles	• Mutual respect and trust
	Emotional intelligence	Develop personal relationship	Individual dependent	
		Long term relationship		

As shown in Table 8-8, Table 8-9, and Table 8-10, trust-building attributes can be influenced by both legal/procedural arrangements (contract) and the project participants' characteristics. It is concluded that the IPD principles and contractual strategies directly correlate with the trust-building attributes.

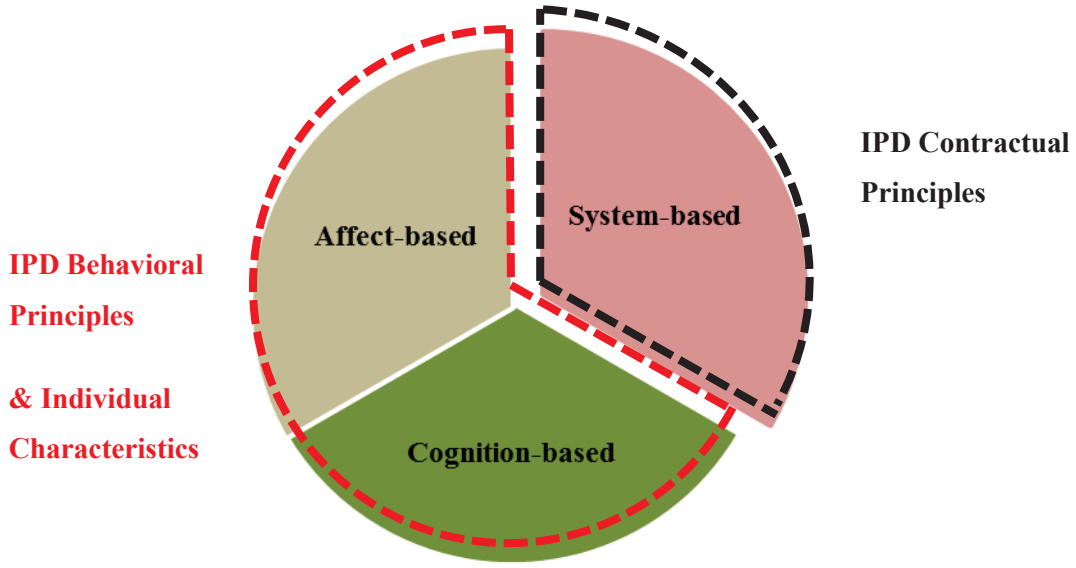

Figure 8-12: Correlation of IPD principles and different types of trust

As demonstrated in Figure 8-12, the IPD contractual principles correspond with the trust-building attributes promoting System-based trust. The IPD behaviorial principles and individual characteristics correspond with the trust-building attributes promoting Cognition-based trust and Affect-based trust.

8.1.5 Assessing Relative Effectiveness of IPD vs. a Traditional Delivery Approach on Trust

Lastly, the mean of all the participants' responses of the relative effectiveness of IPD vs. traditional delivery approach on trust-building attributes in the two case studies (Figure 6-6 and Figure 7-6) are calculated and presented in Figure 8-13.

The interview questionnaire includes a series of multiple choice questions which examine the relative effectiveness of IPD versus traditional delivery approach on trust-building attributes. There are three choices: 1. Less effective, 2. Same, 3. More effective. For the demonstration purpose, an assumption is made to give the effectiveness level of the traditional delivery approach on trust-building attributes, level three. Less effective influence is illustrated in level one, and more effective influence is illustrated in level five. The mean of participants' responses were calculated, and a bar chart developed correspondingly to

schematically demonstrate the relative effectiveness of the IPD approach versus a traditional delivery approach on trust-building attributes**Error! Reference source not found.**. The red dotted line represents the effectiveness of the traditional delivery approach on trust-building attributes, and the green bars represent the effectiveness of IPD approach trust-building attributes.

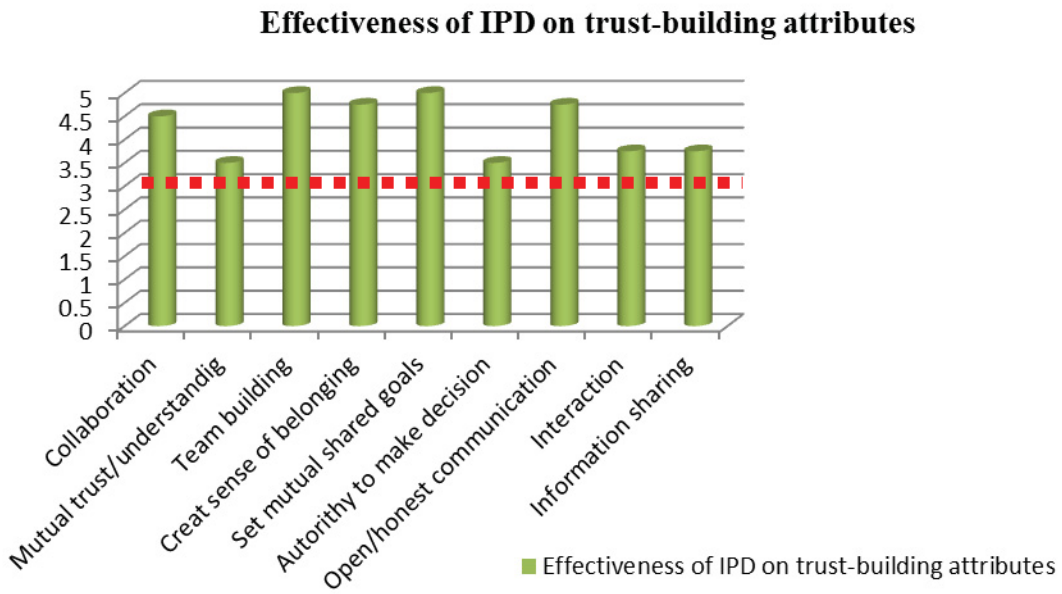

Figure 8-13: Relative effectiveness of IPD vs. traditional delivery approach on trust-building attributes based on the two IPD case studies

8.2 Recommendations for Future Work

This exploratory study and research on trust-building attributes and IPD has established a good foundation for further longitudinal studies on trust-building and team-building techniques in the construction projects. The finding of this research is based on a literature review, study of the contracts of the two IPD case studies, and the interviews conducted with the IPD participants in the two IPD projects. Another expert panel with a different group of IPD practitioners can be formed; and future surveys can be developed and sent out to a larger group of the IPD experts to further validate the result of this research and enhance the findings.

Also research is needed to further study the evolving fields of Project Delivery Contracting Strategies, such as IPD. A few examples of potential research programs are listed below:

1. Enhancing the existing Project Delivery Contracting Strategies Selection Tools by including the IPD approach and its selection factors.

2. Study and analysis of the contingency and insurance structure/amounts and the risks/rewards sharing/allocation in the IPD projects.

   Different IPD projects share risks and rewards to a different extent. It would be interesting to study how changes in the extent to which risks/rewards are shared influence the contingency and insurance structure and their amounts.

3. The study and analysis of the effectiveness of the existing insurance packages in covering risks and liabilities associated with the IPD approach.

   Currently, insurance companies are working to develop insurance products appropriate for the IPD projects. Traditional insurance products are not suitable for an IPD project because when participants assume nontraditional liabilities.

   This could be a subject of future collaborative research with insurance companies to develop alternative insurance products that align with the project goals and the specific risk sharing strategies established among the IPD project participants.

4. The study and analysis of the nature of disputes and the role of collaborative decision making in both causing such disputes or resolving the disputes.

   In IPD projects, decisions are made collaboratively. When a dispute arises it is difficult to identify a party at fault. As a result, a dispute resolution may become significantly complicated and costly.

   "Traditional contracting is about creating boundaries. A well-drafted traditional construction contract clearly defines the parties' responsibilities and the consequences of failure. Responsibilities rarely overlap as that creates ambiguity as to the correct role. The contract's focus is on the transaction – the activity that must be performed. Integrated contract approaches, on the other hand, focus on the relationships necessary for the successful completion of the project. Such relational contracts, unlike transactional contracts, are quite rare in the domestic design and construction industry. As a consequence, a scarcity of legal precedent exists. Therefore, if disputes arise, it may be more difficult to evaluate one's rights and responsibilities or predict potential outcomes. The better the team works together, the more likely it is able to survive internal disputes. Should internal dispute resolution fail, the participants' agreements address methods for external dispute resolution, absent a "no suit" provision" (AIA National, & AIA California Council, 2007).

   A study that investigates the IPD dispute cases and analyze how such disputes can get better resolved by having a good procedure in place will have a valuable contribution.

References

AGC. (2009). Consensus DOCS Guidebook.

AGC. (2010). AGC's BIM Education Program Courses, from http://www.agc.org/cs/bim_education_program_courses

AIA. (2008). IPD Agreement.

AIA. (2009). Lessons learned from applied Integrated Project Delivery.

AIA California Council. (2007). Integrated Project Delivery- A Working definition.

AIA California Council. (2008). Integrated Project Delivery Frequently Asked Question.

AIA National, & AIA California Council. (2007). Integrated Project Delivrey: A Guide.

AIA National, & AIA California Council. (2010). Integrated Project Delivery: Case Studies: AIA, AGC.

AIA National/ AIA California Council. (2009). Experience in Collaboration On the Path to IPD.

Al Khalil, M. I. (2002). Selecting the Appropriate Project Delivery Method Using AHP. International Journal of Project Management, 20(6), 469-474.

Anderson, S. D., Damnjanovic, I., National Research Council (U.S.). Transportation Research Board., National Cooperative Highway Research Program., American Association of State Highway and Transportation Officials., & U.S. Federal Highway Administration. (2008). Selection and evaluation of alternative contracting methods to accelerate project completion. Washington, D.C.: Transportation Research Board.

Ashcraft, H. W. (N/A). Negotiating an Integrated Project Delivery Agreement. via http://images.autodesk.com/adsk/files/negotiating_an_ipd_agreement.pdf.

Autodesk, I. (2007). BIM Goes to School

Ballard. 2000. Lean Project Delivery System. LCI White Paper 8. http://www.leanconstruction.org/pdf/WP8-LPDS.pdf. LCI.

Beard, J. L., Loulakis, M. C., & Wundram, E. C. (2001). Design-Build Planning through Development: McGraw-Hill.

Bowers, D., Bhargava, R., & Anderson, S. (2003). Characteristics of Integrated Project Delivery and Contract Strategies A Report to the CII. Austin, TX: The University of Texas

Camps, H. L. (2008). BIM, Education and the Global Economy. Journal of Building Information Modeling.

CII. (1989). Management of Project Risks and Uncertainties: The Construction Industry Institute.

CII. (1993). Allocation of Insurance-related Risk and Costs on Construction Projects Publication 19-1: Construction Industry Institue.

CII. (2006). Equitable Risk Allocation- RS210-1

CII. (2007). Equitable Risk Allocation: Two-Party Risk Assessment and Allocation Model- IR210-2

Cohen, J. (2010). Integrated Project Delivery: Case Studies: AIA, AGC.

Cooper, B. (2009). Insuring and Bonding Projects Using Integrated Project Delivery.

Cyon Research Corporation. (2003). The Building Information Model: A Look at Graphisoft's Virtual Building Concept

Duke, P., Higgs, S., & McMahon, W. R. (2010). Integrated Project Delivery: "The Value Proposition" An Owner's Guide for Launching a Healthcare Capital Project via IPD from http://www.Project Managergroup.com/IPD_Summary.php

Gordon, C. M. (1994). Choosing Appropriate Construction Contracting Method. Journal of Construction Engineering And Management, 120(1), 196-210.

Henderson, L., & Jordan, N. L. (2009). A Modest Proposal for a Transdisciplinary Curriculum Journal of Building Information Modeling.

Integrated Project Delivery (2010). from http://projectrealign.com/ipd-lean-from-pdg.pdf.

Jernigan, F. (2007). BIG BIM little bim (1st ed.): 4Site Press.

Jordani, D. (2008). BIM: A Healthy Disruption to a Fragmented and Broken Process. Journal of Building Information Modeling.

Kadefors, A. (2004). Trust in project relationships-inside the black box. International Journal of Project Management, 22(3), 175-182.

Kenig, M. (2007, March 21). Understanding Project Delivery Method Retrieved October 15, 2009, from http://www.agc.org/galleries/projectd/Kenig-20070321-PDS.pdf

Konchar, M., & Sanvido, V. (1998). Comparison of U.S. Project Delivery Systems. Journal of Construction Engineering And Management, 124(6), 435-444.

Korkmaz, S., Horman, M., & Riley, D. (2009). Key attributes of a longitudinal study of green project delivery. Paper presented at the Seattle, WA: Journal: Building a Sustainable Future; Proceedings of the 2009 Construction Research Congress.

Lean Construction Institute. (2004). Integrated Project Delivery: An Example Of Relational Contracting.

Lean Construction Institute (2008). Lean Construction Institute, from http://www.leanconstruction.org/.

Lichtig, W. A. (2005). Sutter Health: Developing a Contracting Model to Support Lean Project Delivery.

Longitude Media. (2010). BIM and Education from http://www.cadalyst.com/aec/bim-and-education-1-2-3-revit-tutorial-3671

Loulakis, M. C. (2005). Construction Project Delivery Systems: Evaluating the Owner's Alternatives. Reston, VA: A/E/C Traininig Technologies.

Mafakheri, F., Dai, L., Slezak, D., & Nasiri, F. (2007). Project delivery system selection under uncertainty: Multicriteria multilevel decision aid model. Journal of Management in Engineering, 23(4), 200-206.

Mahdi, I. M., & Alreshaid, K. (2005). Decision support system for selecting the proper project delivery method using analytical hierarchy process (AHP). International Journal of Project Management, 23(7), 564-572.

Matthews, O., & Howell, G. A. (2005). Integrated Project Delivery An Example of Relational Contracting. Lean Construction Journal, 2(1).

Middlebrooks, B, Retreived 10.23.2011. Who is in charge of your Integrated Project Engineering Technology: Leveraging Tools & Process. http://www.ea.ne.gov/PDFs/presentations/CE_EngTech_Middlebrooks10-09.pdf. Autodesk.

Middlebrooks, Retreived 10.23.2011. http://www.aci-na.org/static/entransit/APDS10-Middlebrooks.pdf

Miller, J. B., Garvin, M. J., William Ibbs, C., & Mahoney, S. E. (2000). Toward A New Paradigm:Simultaneous Use Of Multiple Project Delivery Methods. Journal of Management in Engineering, 16(3), 58-67.

Miller, R., Strombom, D., Iammarino, M., & Black, B. (2009). The Commercial Real Estate Revolution: John Wiley & Sons, Inc.

Molenaar, K. R., Triplett, J. E., Porter, J. C., Steven D. DeWitt, & Yakowenko, G. (2007). Early Contractor Involvement and Target Pricing in U.S. and UK Highways. Transportation research record(2040).

Ngowi, A. B., & Pienaar, E. (2005). Trust factor in construction alliances. Building Research and Information, 33(3), 267-278.

Owner B & Contractor. (2010). Construction Agreement for Owner B Improvements.

Owner A & Architect. (2010). Design Services Agreement “PROJECT TWO”

Owner A & Contractor. (2010). Construction Agreement for “PROJECT TWO”

“Project One”. Integrated Form of Agreement.

Oyetunji, A. A., & Anderson, S. D. (2006). Relative Effectiveness of Project Delivery and Contract Strategies. Journal of Construction Engineering and Management 132(1), 3-13

866 379 5021

Pinch, L. 2005. Lean Construction Eliminating the Waste. LCI, Construction Executives.

http://www.leanconstruction.org/pdf/Constexecabc.pdf

Pishdad, P., & Beliveau, Y. (2010). Analysis of Existing Project Delivery and Contracting Strategy (PDCS) Selection Tools with a Look Towards Emerging Technology Paper presented at the 46th Annual ASC International Conference, Boston, MA. http://ascpro.ascweb.org/chair/default.htm

Pishdad, P., & Beliveau, Y. (2010). Integrating Multi-Party Contracting Risk Management (MPCRM) Model with Building Information Modeling (BIM). Paper presented at the CIB W78 2010 Conference

Pishdad, P. B., & Bozorgi, A., & Beliveau, Y. J. (2010). Towards Promoting A Collaborative Mindset: Reaping the Benefits of Big Building Information Modeling (BIM) in an Integrated Real Estate Program. Proceedings of Ecobuild America, BIM Forum Workshop. Washington DC.

Post, N. M. (2010, May 10th). Engineering News Record.

Roberts, H. W. (2010). Build as One: A practice methodology for the building industry.

Rubin, R. A., & Wordes, D. (1997). Changing project delivery systems: Who's at risk, Minneapolis, MN, USA.

Sacks, R., & Barak, R. (2010). Teaching building information modeling as an integral part of freshman year civil engineering education. Journal of Professional Issues in Engineering Education and Practice, 136(1), 30-38.

Salmon, J. L. (2009). AIA v. ConsensusDocs

Swan, W., McDermott, P., Cooper, R., & Wood, G. (2003). Trust in Construction: Achieving Cultural Change.

"PROJECT TWO". Integrated Project Delivery Agreement.

The Construction Industry Institute Project Delivery and Contract Strategy Research Team. (2001). Owner's Tool for Project Delivery and Contract Strategy Selection (pp. 25). Austin, TX: University of Texas.

Thomsen, C., Darrington, J., Dunne, D., & Lichtig, W. (2010). Managing Integrated Project Delivery: CMAA.

Touran, A., Gransberg, D. D., Molenaar, K. R., Ghavamifar, K., Mason, D. J., & Fithian, L. A. (2009). A Guidbook for the Evaluation of Project Delivery Methods TCRP Report 131. Washington D.C.

Warne, T. R., & Beard, J. L. (2005). Project delivery systems owner's manual. Washington DC: American Council of Engineering Companies.

Wilhelm, K. (2007). Collaboration Makes Construction Lean. Target, 23(5).

Wong, P. S.-P., & Cheung, S.-O. (2004). Trust in construction partnering: Views from parties of the partnering dance. International Journal of Project Management, 22(6), 437-446.

Wong, P. S. P., Cheung, S. O., & Ho, P. K. M. (2005). Contractor as Trust Initiator in Construction Partnering—Prisoner's Dilemma Perspective. Journal of Construction Engineering Management.

Wong, W. K., Cheung, S. O., Yiu, T. W., & Pang, H. Y. (2008). A framework for trust in construction contracting. International Journal of Project Management, 26(8), 821-829.

Wood, G., & McDermott, P. (1999). Searching for trust in the UK construction industry: An interim view. Paper presented at the CIB 92 - Conference on Construction Procurement, Thailand.